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Monitoring Times

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*Compatible Receivers:

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7000, 7100, 8500, 9000, R10

AOR

8000, 8000B, 8200

Optoelectronics

Optocom, R11

Radio Shack

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Pro 2035/42 with OS535

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Specifications Scout Mini Scout

10MHz - 1.4GHz	•	•
Reaction Tune	•	•
LCD Display	•	•
<3mV Sensitivity	•	•
Signal Strength Bargraph	•	•
Filter Mode	•	•
Capture Mode	•	•
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knobs & dials help
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IC-R2 (right) Excellent audio, tiny package. 0.5 – 1300 MHz; AM, FM, WFM; easy band switching; CTCSS decode; 400 memory channels; priority watch; MIL SPEC 810 C/D/E; weather resistant; includes 2 AA Ni-Cds and charger.

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Cover Story

Join in the Search for SETI

By Paul Shuch

The search for extra-terrestrial intelligence (SETI) using radio astronomy has moved from the domain of government projects into the backyards of ordinary men and women. The SETI League helps to provide the leadership, fundraising and instruction for the grassroots effort. Paul Shuch, founder of the SETI League, explains the search and what equipment you will need to join this worldwide project. To make it even easier, Grove Enterprises now sells a complete SETI package — minus only the reflector dish. See story, page 8.

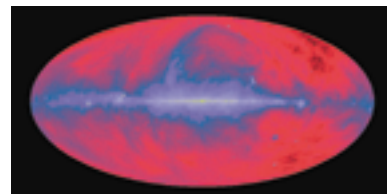
Cover photos: Paul Shuch's backyard SETI dish, courtesy Paul Shuch; background image of Orion Nebula courtesy C.R. O'Dell (Rice University) and NASA.

CONTENTS

Whispers from the Cosmos 14

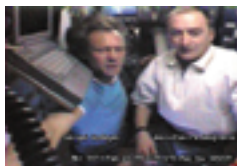
By Larry Van Horn

Have you always wondered what frequencies are used in radio astronomy, and why? How can you know if the static on your receiver could potentially be from outer space? *MT's* assistant editor provides the amateur's guide to the radio astronomy spectrum.



Live Pictures from the *Mir* Space Station 17

By Farrell Winder



Intelligent life from space isn't that hard to pick up. All you need is an inexpensive slow scan TV (SSTV) system to receive *live* pictures from the Russian *Mir* spacecraft!

Monitoring the Crisis in the Balkans 18

Interest in monitoring communications and broadcasts from Balkan countries skyrocketed when NATO mounted a military response to Serbia's aggression against ethnic Albanians in Kosovo. These active shortwave broadcast, utility, and VHF/UHF frequencies were put together by *MT* staff for use by readers and journalists.



The 193rd's Airborne Broadcasting Station 22

By Hans Johnson



The 193rd Special Operations Wing of the Pennsylvania Air National Guard is trained for a unique task — one that is likely to be in increasing demand. In the modern world, information is power, and the 193rd is equipped to provide it ... or to prevent it.

Reviews:

Elliott says Cobra's redesigned MicroTalk Family Radio Service radios are easy to use and come with accessories and models to suit your needs (p.87). Magne tests the Luke DP-976 wind-up radio and pits it against similar emergency radios which include shortwave (p.90). Catalano built an interface and picked out control software in anticipation of getting an Icom IC-R2 wide-band pocket radio for his birthday — and he's glad he did (p.88)! Get on the low frequency, license-free band with your own, homebuilt transceiver; Carey reviews a kit on p.96. Parnass looks at Mini-Circuits' four-port antenna splitter and visits several other topics of interest to scanner owners (p.92).





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DEPARTMENTS

Washington Whispers	4	American Bandscan	76
Amateur Satellite to Promote Swatch		"Go 'n buy the book"	
Communications	6	Outer Limits	77
Scanning Report	26	Radio Free Berkeley Returns	
Connecticut on the Move		Below 500 kHz	78
Service Search	29	Ham Band Update	
Civilian Aero Assignments		PCS Front Line	80
Utility World	30	Surfing on a Mobile Phone	
More Maritime Changes		Experimenters Workshop	82
Digital Digest	33	Modifying the Sony WaveHawk	
Old Systems Still Going Strong		Antenna Topics	84
Global Forum	34	Repeaters and their Antennas	
Find it on the Web		On the Ham Bands	86
QSL Report	38	Adventure Radio Society	
You Asked for It!		And More!	87
English Lang SW Guide	40	Cobra's MicroTalk FRS radios	
Propagation Conditions	60	Computers & Radio	88
Knife Edge Refraction		Interfacing with the Icom IC-R2	
Programming Spotlight	61	Magne Tests	90
Down Memory Lane		Luke DP-976 Emergency Radio	
Satellite Radio Guide	62	Scanning Equipment	92
The Launching Pad	66	Mini-Circuits ZFSC-4-1 Splitter	
Multi-Reception with a Fixed Dish		Ask Bob	94
Beginner's Corner	68	Roll your own NiCds	
Kit Building the Uncle Skip Way		Review	96
View from Above	70	EXP-1750 LF Transceiver Kit	
Storms over Yugoslavia		What's New	97
The Fed Files	72	Letters	101
Monitoring in Western Arkansas		Stock Exchange	102
Plane Talk	74	Advertisers Index	102
A Toast to Air Traffic Controllers		Closing Comments	104
		Scanner Listeners and the Law	

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Amateur Satellite ^{was*} to Promote Commercial Venture

In a fast-breaking story overflowing with international intrigue and mystery, amateur radio operators around the world are incensed by what appears to be the use of amateur radio spectrum to promote a new timekeeping method on the ham bands. The Swiss Swatch (watch) Company has contracted with Russia to broadcast messages about "Swatch Beat" time on the 2-meter ham band from space.

The story really begins in the fall of 1997 when an 8-inch diameter, 4 pound mini-Sputnik satellite was launched by hand from the Russian *Mir* space station. The purpose of Sputnik-40 (or RS-17) was to commemorate the 40th anniversary of the launch of the first artificial Earth satellite by the USSR in 1957 which marked the beginning of the Space Age. The mini-Sputnik transmitted a "beep-beep-beep" beacon on 145.820 MHz — sounding just like the original Sputnik. A Sputnik-40 website was set up at <http://www.oceanes.fr/~fr5fc/angspoutnik.html>, which is still operational. A year later the nearly-identical Sputnik-41 (RS-18) was launched.

Both satellites were part of a program of Sputnik-replica satellites initially built under a partnership between French radio club members at the Jules Reydellet College (FR5KJ) in St. Denis Reunion Island and Russian students at the Polytechnic Laboratory of Nalchik Kabardine Balkar Republique in the Russian Federation. AMSAT-France and the Russian Aeronautic Federation were the lead organizations overseeing the project. The Russian students (with help from engineers at RKK Energia) built the satellite structure, the French teenagers provided the electronic module, software and transmitter.

The RS-17 and 18 projects were financially sponsored by many large corporations and many other sponsors contributed operational support. Sponsors received promotional recognition on the web site, but not on the amateur airwaves.

Russia to build, launch Sputnik-99

Last December, AMSAT-Russia and the SCSC (Space Flight Control Centre) in Moscow contacted AMSAT-France and asked them to manufacture another (200 milliWatt) RF electronic module which would be incorporated in a new Sputnik-99 (RS-19). The contract to provide the spacecraft's electronics also specified that its messages had to comply

with the international amateur rules. "No direct advertising can be made on the air."

Soon after the contract was signed, AMSAT-France learned during technical discussions that the SCSC had entered into a side commercial contract with the Swatch company of Switzerland ...a very large and respected Swiss watch company. Swatch wanted the satellite to be named "*Beatnik*" and to be able to broadcast voice and HTML messages that would promote their new, copyrighted Internet "Beat" time. The 2-meter broadcasts would be aimed at the general public, not just ham radio operators.

AMSAT-France immediately objected. The Russian Space Flight Control Centre, however, said that they would assume all the responsibility for the questionable transmissions and if AMSAT-France did not complete the contract, they would be sued for breach of contract. AMSAT-France delivered the electronic modules and software.

The EPROM program was filled with ten test messages prerecorded by AMSAT-France. In addition, the electronic module has the capability to transmit digital text in the form of HTML pages and telemetry indicating battery voltage and internal temperature.

SCSC, however, recorded and inserted their own ten voice messages for broadcast which AMSAT-France says are unacceptable. They object to the name of the satellite itself, *Beatnik*, which indicates the identity of the commercial sponsor. And the voice messages refer to the "beat" (for Internet "Beat" time), a registered trade mark of Swatch.

Now AMSAT-France wants the amateur community to ignore *Beatnik* and asks that no tracking information (keplerian elements) of the satellite be published in the AMSAT keps bulletins. Neither the AMSAT-NA web site at <http://www.amsat.org/> nor the English-version of AMSAT-France at: <http://www.ccr.jussieu.fr/physio/amsatfrance/eindex1.htm> makes any mention of RS-19, *Beatnik*, or Sputnik-99 at all.

Bernard Pidoux, F6BVP, AMSAT-France president adds that "...AMSAT France is very sorry for this bad situation and hopes that you will understand that we did not want to achieve this." AMSAT-France has now discontinued all future involvement in the joint French/Russian educational project and is now developing a new educational amateur satellite project for French schools.

SpaceNews reported that "The latest miniSputnik will transmit stored voice messages in many different languages on a frequency of 145.815 MHz (+/- Doppler) with 200 milliwatts of power. Up to ten messages will be transmitted by the tiny, battery powered satellite. Each message will be 7 seconds long and include a 7 second pause. There is the ability to change the message every 24 hours."

Beatnik is apparently already on board *Mir* and launch can be expected at any time. The expected operational lifetime of the mini-Sputniks is only about 30 days, since they are powered by regular batteries and not solar cells.

The commercial Swatch time zone

Swatch has been seeking "beat" related voice and text messages on its website (see: <http://www.swatch.com/beatnik/frameset.html>) for its "Beatnik Mission." Swatch will select some of these for broadcast "to a worldwide audience" between 145.800 and 146 MHz. Interestingly, Swatch has already enabled their own satellite tracking program at the above Internet address which does not rely on keplerian elements.

Swatch is supporting a new timekeeping standard. "Internet beat time" divides the day into 1000 parts or "beats." Based on a 24 hour day, a "Swatch beat" equals one minute, 26.4 seconds. Unlike UTC (Universal Coordinated Time) — which starts at just past midnight at 0 degrees meridian — "beat time" is based on a new meridian that passes through Biel, Switzerland, where Swatch has its headquarters.

The BMT (Biel Mean Time) meridian was inaugurated on October 28, 1998, in the presence of Nicholas Negroponte, founder and director of the Massachusetts Institute of Technology's Media Laboratory. "500 Swatch Beats" would be 12 noon in Biel, Switzerland. And like UTC, BMT and "500 Beat" would be the exact same time at every place in the world.

Will Swatch Internet Time catch on? It just might! CNN has already adopted it on its web page. They are time stamping news stories in Swatch Internet Time ..."@648" for instance. (Check: <http://www.cnn.com/>) They also have a link from the top of their home page to a "worldtime" converter that includes a "shockwave" global time zone map and a way to change Internet time into local time at various major cities through the world and vice versa.

*See "Communications" p. 7

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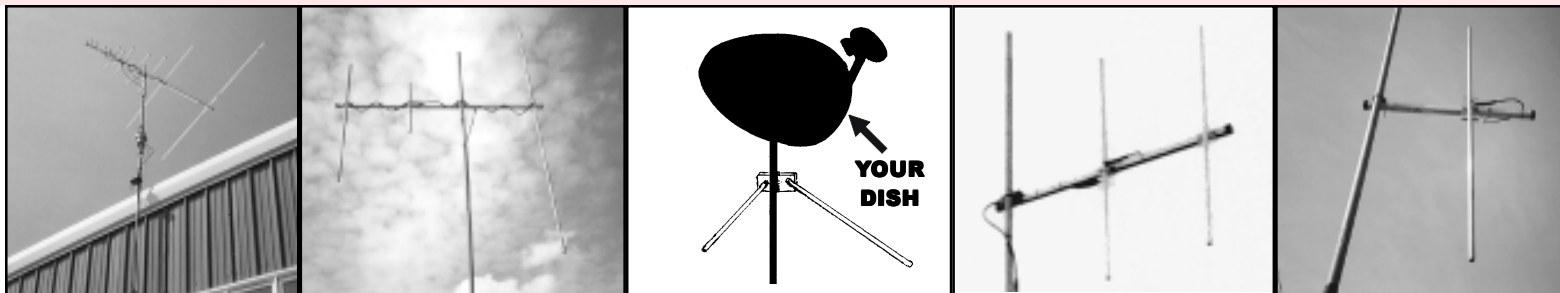
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HD-146-V3-U

HD-6M or 10M-WB-OMNI-U

CATEGORY/MODEL	FREQ/COV(*)	DESCRIPTION	CONN.	dB GAIN	DIMENSIONS BOOM LG EL	WEIGHT (LBS)	WINDLOAD (SQ.FT.)	POWER RATING	SHIPPING WEIGHT
BROADCAST TV/FM — SCANNER									
HD-TV-VHF/UHF-FM-F	TV CHNLS 2-69 FM-Stereo	Compact, Long Range, Full Coverage TV VHF/UHF/FM The ultimate antenna for the new digital high definition Television (HDTV) Broadcast: VHF low 10dB, Hi 12dB; UHF 21dB	F	(**)	88" 108"	7.5	1.5	N/A	12.5 LBS.
HD-SCANNER-WB-OMNI-F	25-1300 MHz	Long Range, Continuous Coverage Top or Side ### Mount to Mast/Tower ### no add'l hardware needed (Still Omnidirectional)	F	(**) 6.2 dB	67" 90"	7.5	1.9	N/A	12.5 LBS.
HD-TV/FM-S.OMNI-F	TV CHNLS 2-69 FM-Stereo	Unique 'Steerable Omnidirectional' Mount Almost Anywhere onto Wall or Mast (***) On/In Rooftop/Attic/Existing Satellite Dish Mast Mount/Side of House/Closet/Etc.!	F	Unity (**) 5.2 dB	N/A 30" [ant.19"(h) x 40"(w) x 3"(d)]	1.0	0.2	N/A	3.0 LBS.
HAM-VHF YAGI									
HD-146-V3-U	142-150 MHz	End Mnt, 3 ele. Vert. using mast/tower for reflector Detailed, easy to follow, stacking instructions included for even higher gain!	U	12 (15 dB if stacked!)	36" 36"	3.5	0.4	600 W	6.5 LBS.
HAM-WB-OMNI VERTICALS — SIDE ARM MOUNT WITH HARDWARE INCLUDED									
HD-10M-WB-OMNI-U	26.9-30 MHz	Top or side mount, S.M.I.A. (##). 3.1 (HAM) dB; 10.6 ("CB LINGO") dB	U	(#)	72" 204"	5.5	1.6	1000 W	10.5 LBS.
HD-6M-WB-OMNI-U	50.0-54 MHz	Top or side mount, S.M.I.A. (##)	U	(#) 3.1 dB	42" 108"	3.5	0.9	1000 W	8.5 LBS.

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NOTES: (*) For Ham antennas, usable frequency range transmitting with an SWR of 1.5:1 or less, typically less than 1.2:1. Frequency Range shown is usable without retuning the antenna! No tuning is required for any Nil-Jon Antenna: just assemble and install using the guidelines in your instruction manual.

(**) With TV/FM and Scanner Antennas, most manufacturers are very vague about what to expect for performance or gain, and gain figures given seemed quite high for results obtained. All competitive models tested were below Nil-Jon's performance. Even several different manufacturers' largest TV antenna models (close to three times our size) (including one model that claims a 200 mile range!), fell short on an overall total performance basis, of the consistent performance obtained from the Nil-Jon's Compact 7'4" TV model! Nominal gain figures are shown for our antennas.

(***) With optional Mast Clamp Kit

(#) Other antenna companies claimed gain figures which seemed quite high for the results obtained, and the Nil-Jon Antennas substantially outperformed them. Nominal gain figures are shown for our antennas.

(##) S.M.I.A. means Support Mast Interaction Adjusted. Every Nil-Jon Antenna uses calculations for the interaction of other objects, such as your own mast.

ABBREVIATIONS: dB=Decibal, F="F" Connector, HD=Heavy Duty as in High Strength & Performance, not weight, LBS=Pounds, LG-EL=Longest Element, M=Meter, MHz=Megahertz, U=SO-239 "UHF" Connector, V=Vertical, WB=Wide-Band, SQ. FT=Square Feet (Windload includes boom, where applicable)

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The scanner system report

Changes in public safety systems sent by our readers

- New Hampshire State Police completed installation of a Motorola digital radio system in 1998.
- Sarasota County, Florida, installed a Motorola digital system in 1998. The media was to be allowed access to the main dispatch channels, but would be required to purchase a \$3,000-10,000 Motorola receiver.
- West Warwick, Rhode Island, police completed the installation of their Motorola digital communications system in April, using the same frequencies as their old system. However, neighboring Warwick's police chief says they have no plans to go digital anytime soon. "We see more benefits than problems," he says, referring to public access to police communications. "Often it's those citizens who are our eyes and ears."
- Chester County, Pennsylvania, installed an E.F. Johnson trunked system in 1998, after being plagued by delays and technical glitches.
- Connecticut has finally signed a contract with Motorola for an 800 MHz digital trunked system to replace the 50-year-old system still used by its state police.
- Tarrant County, Texas, will be receiving new computers in the dispatch center and removable laptop computers in the patrol cars. According to the *Star-Telegram* article, "The county's old computers transmitted on radio frequency. The new ones will be based on a cellular digital communications system." (And that's not radio?!)
- Saratoga Co., New York, continued to delay final decisions on its planned radio system upgrade. "Every answer seems to lead to two new questions," said the chairman of the county's Public Safety Committee. Officials don't expect actual construction to begin before 2000.
- Arlington Heights, Buffalo Grove, Elk Grove Village, Mount Prospect, Palatine and Prospect Heights, Illinois, will switch this fall to a digital Motorola system. Hoffman Estates and Streamwood, also members of Northwest Central Dispatch, recently purchased new analog systems and will not immediately participate.
- Oakland County, Michigan, commissioners are studying how to put together a system that will enable municipalities to talk to each other. According to *MT* reader Ira Paul, this county just north of Detroit, has a population of 1,151,000; most agencies are not on the 800 MHz band, but use a mixture of 154-156 MHz and 423-425 MHz channels.
- Georgia state agencies contracted with Southern Company for a wireless system known as Southern LINC, which uses a Motorola-built radio which combines the functions of cellular phones, page systems, and two-way radios.

- Wake County, North Carolina's outgoing commissioners approved a contract with Motorola for a new 800 MHz public safety system.
- Arkansas state police say their 8-year-old system is already outdated. Sprint is updating their microwave system from analog to digital, and will include video communications, mobile data terminals, and voice encryption. However, many spare parts for the aging Motorola radios are no longer available.
- Nextel purchased all 800 MHz frequencies in Southern California, according to a story in the *San Bernardino County Sun*. In exchange for San Bernardino giving up its 800 MHz

frequencies, Nextel will upgrade the public safety radio system.

- All of the Houston, Texas, Sheriff's department radios on the Smartzone system failed for most of one day in December. A back-up system kicked in after about a half-hour which allowed dispatchers access to one radio channel in each of the department's four districts. The problem appeared to be only with radios that had been programmed a couple of weeks before.
- Sacramento, California, sheriffs were forced to rely on an old radio system and computers when their sophisticated regional emergency communications system broke down. A spokes-



(See www.grov-ent.com/hmpgmt.html for more events and club info)

June 6: Butler, PA

45th Breezeshooter's Hamfest, Butler Farm Show grounds, Rt. 68 north of Butler; Talk-in 147.96/.36. 8a.m. - 4p.m., \$5 admission. www.breezeshooters.com for more info, or contact Rey Whanger, W3BIS, 412-828-9383.

June 13: Knoxville, TN

Knoxville Hamfest, National Guard Armory, 3330 Sutherland Ave, 9am-4pm, admission \$5. Talk-in 147.30+ / 224.50- / 444.575+ . VE exams, register before 1:30; clinic, CW contests, forums, etc. Info <http://www.korrnet.org/rack>

June 18-20: Mason, OH

Nat-com '99, Holiday Inn Express near King's Island Amusement Park. Admission \$10 at door. Speakers, emergency vehicles, fox hunt, prize drawings. Sponsored by the Bearcat Radio Club (Norm Schrein), P.O. Box 291918, Kettering, OH 45429 or 800-423-1331, www.bearcat1.com/natcom99.htm.

June 19: Dunellen, NJ

Raritan Valley Radio Club hamfest, Columbia Park near intersection 529 and 28. Talk-in 146.025/625, 146.520 simplex. 7a.m.-2p.m.; Admission \$5. Contact Bob Pearson WB2CVL, 832-846-2056.

June 19 & 20: Special Event Station

Station N5C from Chaco Canyon, Chaco Culture Natl Historical Park, NM, grid square: DM66ba, 1600 - 2400 UTC Sat. & Sun. Modes CW, SSB, AMTOR, FM. 2-40 meters {QRO&QRP} / Novice/Tech/General portions of the bands. QSL & SASE #10 envelope to N5C, Jay Miller, WA5WHN, P.O. Box 6552, Albuquerque, NM 87197-6552. wa5whn@hotmail.com or <http://www.swcp.com/~n5zgt/> for more info

June 20 (Father's Day): Monroe, MI

Monroe Co RAC hamfest, Monroe County fairgrounds (M-50 at Raisinville Rd), Talk-in 146.72/12; 7:30am-1:00pm. Contact Fred VanDaele, 4 Carl Drive, Monroe, MI 48162, 734-242-9487. Tug-O-War, Liars contest/QLF contest. [Midland Swap Saturday 19; camp overnight \$15]

June 25-27: Las Vegas, NV

Intl Radio Club of America/DecalcoMania Ultra-Convention at the Holiday Inn-Boardwalk (800-635-4581 or www.hiboardwalk.com, mention discount code IRC for room rate \$55 plus sales tax). Convention registration \$35 (\$15 registration + \$20 banquet) to Mike Sanburn, PO Box 1256, Bellflower, CA 90707. Include name, address, phone, date arrival, number of persons, club affiliations.

Hobby News

- The web-based club, **Cumbre DX**, has a new website www.cumbredx.org and email address cumbredx@yahoo.com
- Two Australian clubs, Southern Pacific Union of DXers (SPUD) and DX Australia, are no longer in existence (via Stephen Newlyn)
- Jacques d'Avignon's propagation forecasts for Canadian radio hobbyists is available at www.rac.ca/proptxt.htm to supplement *The Canadian Amateur* magazine which is now bimonthly.
- A new internet mailing list discusses shortwave programming content, critiques, and developments. The list address is swprograms@topica.com; to subscribe, send a blank E-mail to swprograms-subscribe@topica.com. (via Richard Cuff)

man said such problems are bound to happen in such sophisticated systems, and that's why backup lines and old radios were kept in place.

Worldspace Takes on the US Military

The Worldspace Afristar satellite launched in October: Receivers to pick up the satellite-delivered radio broadcasting are coming on the market. And Worldspace has plans for two more satellites, AmeriStar and AsiaStar.

But there's a hitch to the company's ambitious plans: these satellites all broadcast on L-band (1435-1525 MHz), to which the U.S. retains exclusive right by international agreement. The U.S. military and the aeronautical industry use the L-band for flight testing of new systems. AmeriStar's spot beams will cover every U.S. test range.

The plan is being protested by both the U.S. and Canada (who have already worked out their own L-band conflicts; see January '99 *Communications*). The dispute has been taken to the International Telecommunications Union (ITU), but latest plans by WorldSpace are still to launch AmeriStar in October.

Beatnik Launch Canceled

On April 16th, the Russian Space Program and Swatch were to launch the satellite "beatnik" into orbit with the capability of sending voice and text messages from people all around the world. Their plan to use frequencies in the 2-meter ham band had radio amateurs up in arms (see page 4 for the full story).

However, before we went to press, we learned the launch was canceled. A Russian transmitter which was a key element in communications to the *Mir* space station was severely damaged. Swatch decided to instead donate the batteries supporting the beatnik satellite (which was already on board *Mir*) to the cosmonauts, who will be using them to run the printer onboard through which the cosmonauts receive their daily instructions.

The messages that had been recorded in the beatnik memories and which caused such controversy have been posted at <http://www.swatch.com/beatnik/index1.php3>

Safety First

www.speedtrap.com may be having an unintentional effect. This web site joins radar detectors, scanners, CBs and other devices used by motorists trying to outsmart police. The web site lists thousands of speed traps around the country and includes average fines and local scanner frequencies.

Are police upset? Not necessarily: "The purpose of speed enforcement is to reduce car crashes and save lives," Massachusetts State Police Captain Robt Bird told a *Union Leader* reporter. The web site accomplishes the same thing; it slows drivers down.

Safety First - II

Several states have considered a ban on the use of cellular phones while driving — none have passed, to our knowledge. But Brooklyn, Ohio, isn't waiting for a state law to deal with distracted drivers. The town has become the first in the nation to outlaw the use of cellular phones while driving. Cell phones have been cited as the third largest cause of vehicular accidents.

Australian Ham receives SETI Award

The SETI League (see this month's cover story) awarded its highest honor to an Australian pioneer in the amateur search for intelligent life in space. Noel Cedric Welstead, VK4AYW, received the Giordano Bruno Memorial award for contributions to amateur radio astronomy. Welstead is credited with building the first amateur SETI observatory in Australia. He was the first amateur astronomer to observe and report the phenomenon which has been dubbed "wiggles," and helped to trace their origin to computer-generated radio frequency interference. Welstead has developed an impressive website at <http://www.seti.org.au>.

One more SETI scenario

In February we reported on the project (called SETI@home) to search for extra-terrestrial intelligence (SETI) using raw data from the huge radio telescope at Arecibo, Puerto Rico, and tasking home computers around the world with analyzing the data.

Another innovative approach is being taken by astronomer Frank Drake in a joint project with the University of California at Berkeley and the SETI Institute in Mountain View. The researchers plan to erect about 750 12- to 18-ft. dishes at the Hat Creek Observatory near Redding, California. Computer software will enable the array of commercially-available

dishes to emulate a telescope of much greater power at much smaller expense.

Bill to Protect Amateur Radio

HR 783, Amateur Radio Spectrum Protection Act of 1999, was introduced in the House by Mr. Bilirakis. The bill's intent is to ensure the availability of spectrum to amateur radio operators.

The bill finds that although "Emergency communications services by volunteer amateur radio operators have consistently and reliably been provided before, during, and after floods, hurricanes, tornadoes, forest fires, earthquakes, blizzards, train accidents, chemical spills, and other disasters ... The Federal Communications Commission has taken actions which have resulted in the loss of at least 107 MHz of spectrum to radio amateurs."

HR 783 establishes a policy that after July 1, 1999, the FCC would (1) make no reallocation of primary amateur allocations; (2) not diminish the secondary allocations; and (3) make no additional allocations that would substantially reduce the utility of such bands; unless the Commission, at the same time, provides equivalent replacement spectrum to amateur radio and amateur satellite service.

HR 783 was referred to the Subcommittee on Telecommunications, Trade, and Consumer Protection on March 3rd.

"Communications" is compiled by Rachel Baughn, Editor, with help from this month's fine reporters: Anonymous, NH; Anonymous, NY; E. Baca, NM; Jim Boehm, TX; Chet Copeland, email; Bill Crocker, email; T. Grant, MA; Wm Hassig, IL; Steve Kaatz, MI; Gerald Kercher, CT; Kevin Klein, WI; Bob Kozlarek, NJ; Ryan McCarthy, NY; Ted Moran, email; Ed Muro, NY; Doug Robertson, CA; Ed Schwartz, IL; Richard Sklar, WA; George Speck, TX; David Sterley, email; Robt Thomas, CT; Larry Van Horn, NC; John Vercellino, IL; Sue Wilden, IN

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By H. Paul Shuch, Ph.D.
Executive Director, The SETI League, Inc.

Join in the worldwide, backyard Search for



The search for some ordered and therefore intelligent signal buried in the background chaos uses equipment that is today available to nearly everyone.



*Perhaps ET
is not phoning
home after all.
Maybe he's trying
to call us ...*

The Search for Extra-Terrestrial Intelligence (SETI), once a multi-million dollar NASA venture, is now in private hands. In 52 countries on six continents, a thousand dedicated experimenters are now using their backyard SETI stations to seek out that elusive needle in the interstellar haystack.

You can't buy a radio telescope at your local Radio Shack store. But now, thanks to a joint effort between the SETI League and Grove Enterprises, you, too, can join the search for our cosmic companions with components or a complete system. Or, if you're reasonably handy with tin-snips, know which end of the soldering iron is the handle, and have a few hundred (to a few thousand) dollars to invest, you can build your own.

What We're Looking For

Our Earth is surrounded by a telltale sphere of artificial radiation, now extending out to about 50 light years and still traveling outward



Without a doubt, the 1997 movie "Contact," starring Jodie Foster, rekindled the public's interest in the search for "signals from space."

at the fastest possible speed: the speed of light. This radio, TV, radar, and microwave pollution is readily detectable to any local civilization which has radio astronomy. We figure that some of the countless beings living in the light of distant suns may also pollute their radio environment, and we stand a reasonable chance of detecting them.

But don't expect to tune in an alien *I Love Lucy*. Interstellar signals will be so weak that our eyes and ears will never recognize them. The most we can hope for is order in the cosmic chaos, patterns which could not have been produced by any natural mechanism which we know and understand. These hallmarks of artificiality are evident to computers, and it is your home computer which will sift through the cosmic static in search of ET (see Figure 1).

Now, where on the dial should we look? It's highly unlikely that ET honors the Federal Communications Commission band plans, so we can only guess as to their likely channel lineup. There may well be many good frequencies for SETI, but what they must have in common is their ability to pass unimpeded through the interstellar medium. Since the space between the stars is most transparent in the microwave spectrum, that's where we'll start our search.

Satellite TV is broadcast in the microwave region. So are radar, cellular telephone, and much of Earth's telecommunications relay signals. There are also navigation signals from the swarm of Global Positioning Satellites (GPS) surrounding our planet. If we're going to seek out weak signals from the stars, we need to search in the gaps between our own transmissions. One such interesting gap (there are others) is the resonant frequency of hydrogen atoms, 1420 MHz, and many amateur and professional SETI stations start out there.

What You'll Need:

THE ANTENNA

Although other configurations are sometimes used, the hands-down favorite for snagging alien photons is the parabolic reflector, or dish antenna. A 3 to 5 meter (10 to 16 feet) diameter dish is just about the right size to stand a reasonable chance of SETI success. The classic C-band backyard satellite TV dish is ideal. These have high gain, narrow beamwidth, work over a wide range of frequencies, and are readily available for next to nothing. And if you're a satellite TV fan, chances are you already have one.

Around the country millions of TV viewers are upgrading to Ku-band Direct Broadcast Satellite (DBS) reception. Its half-meter dishes are very appealing. That leaves millions of C-band BUDs (Big Ugly Dishes) sitting around gathering rust. Many SETI enthusiasts

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have found neighbors anxious to have these eyesores taken off their hands (see Figure 2).

You can use your satellite TV dish to focus 1420 MHz energy, but *not* its C-band feedhorn. Plan on building or buying a larger tin can to capture these longer wavelengths. A commercial feed which will directly replace your TVRO horn (see Figure 3) can be purchased for around \$150. If you want to use your BUD to watch TV and do SETI in the background, you can mount your SETI feedhorn next to your TVRO one, and multi-task (see Figure 4).

THE PREAMP

The purpose of a preamplifier is to take an impossibly weak signal from space, and turn it into merely a ridiculously weak one. You used one of these for satellite TV (it may have been called an LNA, LNB, or LNC), but it probably doesn't work on ET's channel. Fortunately, radio astronomy preamps for the desired frequency range (see Figure 5) are readily available from a number of sources. Price varies from about \$50 for a kit preamp up to perhaps \$200 for a top of the line, assembled and tested one.

The preamp mounts directly to the feedhorn with a coax connector, and drives the coaxial feedline which runs inside to your receiver. You'll also need to run juice from a 12-volt power supply up to your preamp, either through the feedline or on a separate length of lamp cord or speaker wire.

THE RECEIVER

Once you've amplified your weak alien signal, you'll need to break it down to audio components which your computer can analyze. This is the job of a microwave receiver. The earliest amateur SETI stations employed ham radio's old standard, the venerable Icom model R-7000 wide-coverage receiver, and its successors, the IC R-7100 and the current R-8500 (see Figure 6). The AOR AR5000 Plus and AR7000 are two additional choices.

These highly capable receivers are a good bet, though the nearly-\$2000 price tag exceeds the cost of all other parts of your SETI station combined. Fortunately for the frugal signal searcher, some less costly alternatives are emerging.

For years ham radio operators have been converting microwave signals down to frequency regions which their existing short-wave receivers can process, and SETI is no

Tool Chest for Locating ET



FIGURE 2

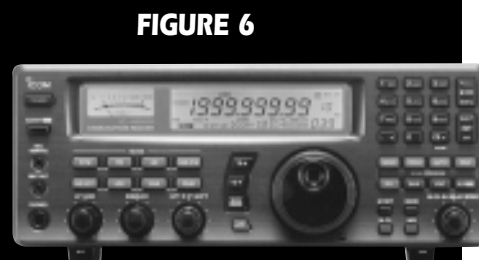


FIGURE 6

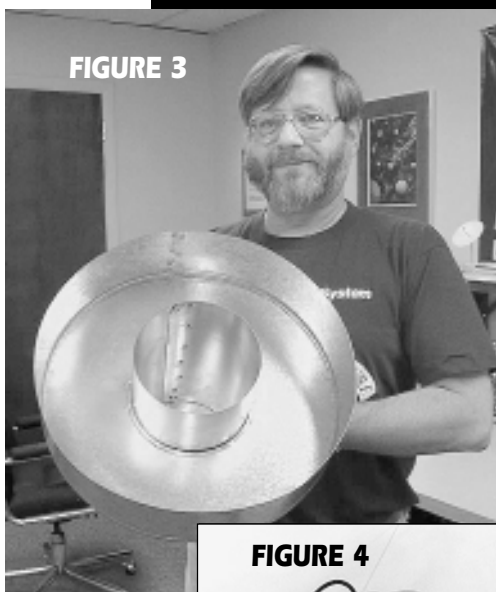


FIGURE 3

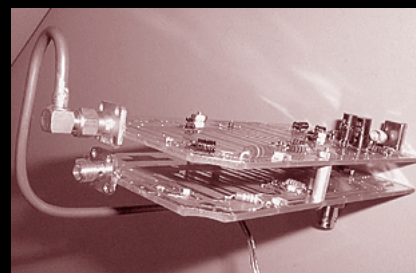


FIGURE 7

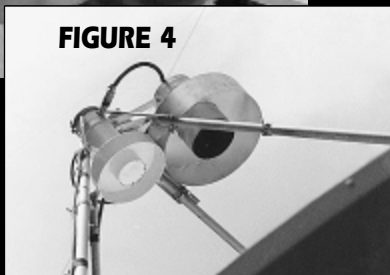


FIGURE 4



FIGURE 8

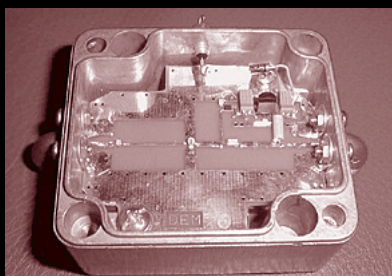


FIGURE 5

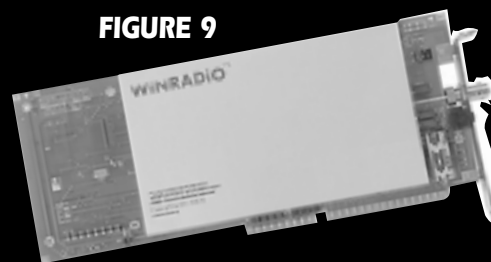
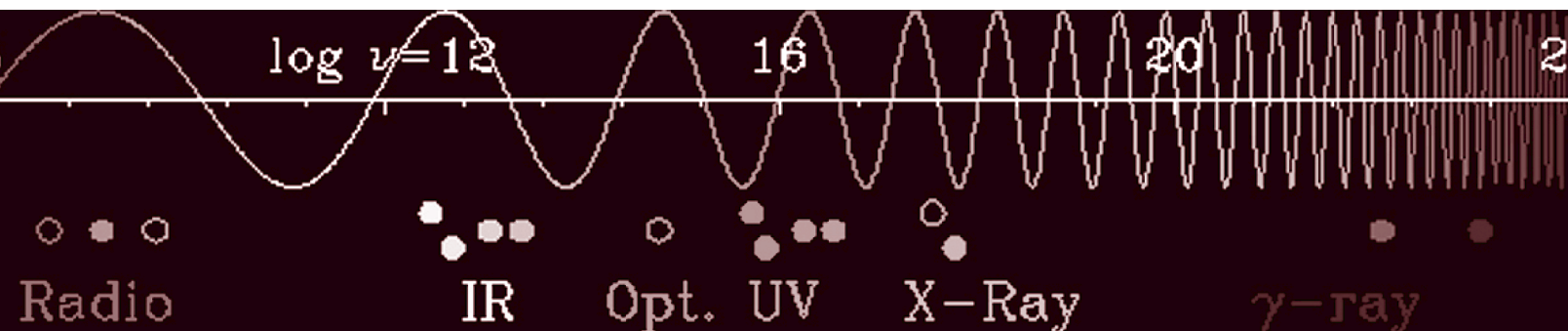


FIGURE 9

Grove invites you to join our search for . . .



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exception. For just over a hundred dollars in kit form (twice that if already assembled), you can today buy a downconverter which will shift the most interesting radio astronomy frequency down to the popular two meter band for reception in your existing VHF rig (see Figure 7).

By adding a \$100 2-meter SSB receiver kit to that downconverter (see Figure 8), enterprising experimenters have been building their own complete SETI receivers for a small fraction of the cost of commercial units. We hope such packaged special-purpose receivers will come on the market as manufacturers recognize the market potential of SETI.

Lately, receivers-on-a-card are all the rage. For example, Rosetta Labs of Australia makes its WiNRADiO scanning receiver, available both as plug-in cards and external modules (Figure 9) to be hosted by your personal computer. The newest models WR1500 and 3100 are providing improved performance at significantly reduced cost.

THE COMPUTER

The purpose of the SETI computer is to run the software which recognizes ET amid the cosmic din. A good bit of number-crunching power is required. The technique is called Digital Signal Processing (DSP), and is the one part of the SETI task which has grown in power at an amazing rate. Raw computer horsepower seems to double every year or so,

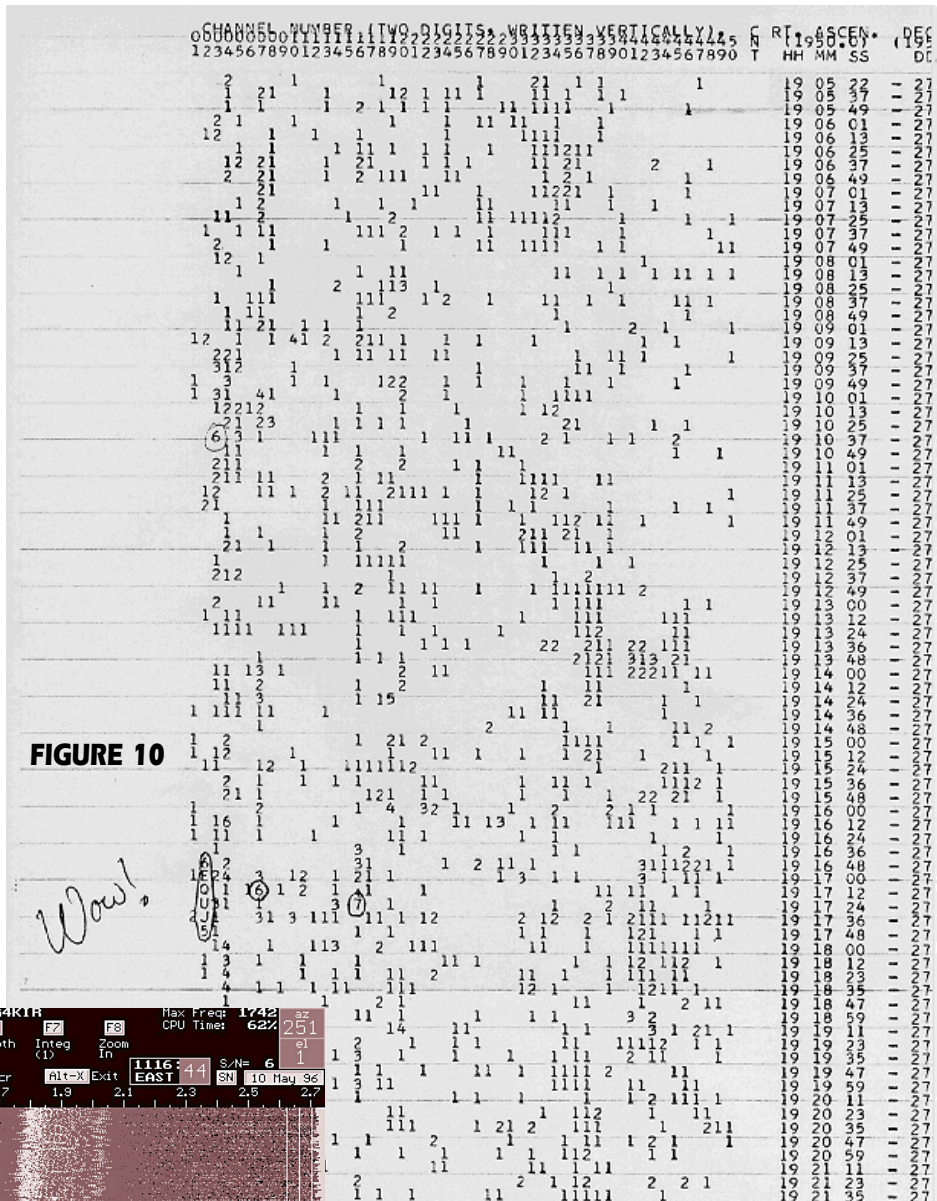


FIGURE 10

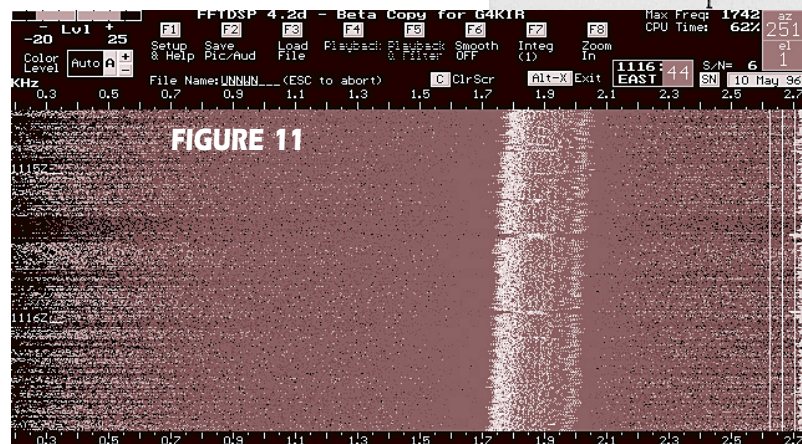


FIGURE 11

which means today's home computers are 1000 times more powerful than those of just ten years ago, and 1,000,000 times more powerful than those of two decades past!

We start by breaking down the receiver's audio into ones and zeroes, using a circuit called an Analog-to-Digital Converter; there's a very capable ADC in your garden-variety \$29 sound card, and that's what most of us are using.

DSP software comes in a variety of flavors, with the most popular varieties being shareware for the DOS and Windows envi-

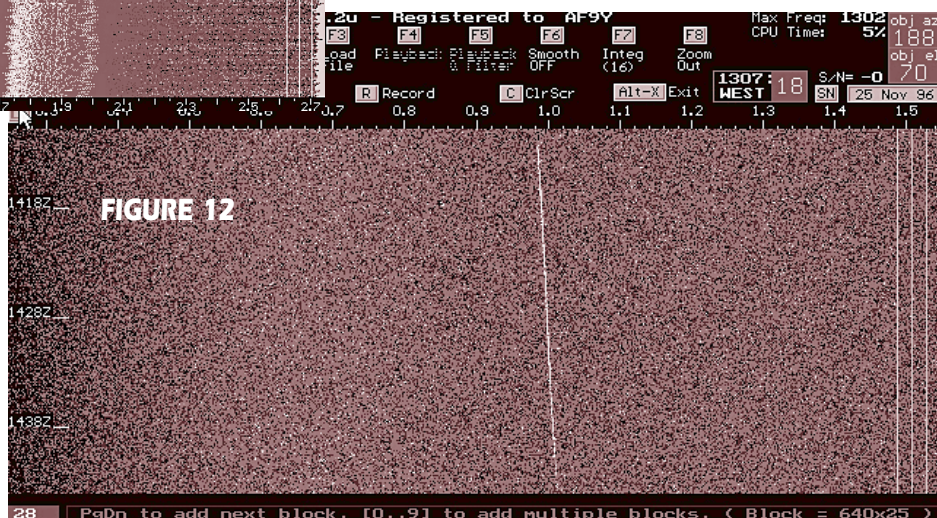


FIGURE 12

ronments. As for the computer on which this software runs, a high-speed Pentium is nice, but not essential. Many a SETI enthusiast has used the old 486, which his or her Pentium recently replaced, as a dedicated signal processing machine. And a few SETIzens have even resurrected their old 386 and 286 machines for DSP use. The rule seems to be, any computer you can get your hands on will be more sensitive than your own eyes and ears in separating the alien wheat from the cosmic chaff!

Putting It All Together

All the bits and pieces can be a tad intimidating, but you won't be going it alone. The SETI League is the world's leading grassroots SETI organization, with hundreds of members in dozens of countries on six continents, and growing. Our website (<http://www.setileague.org/>), technical manuals, and volunteer regional coordinators have already helped hundreds of individual experimenters to get their stations up and running, and they stand ready to assist you as well.

SETI league members come from all professions, educational levels and walks of life. We share a common curiosity about the beyond, as well as a conviction that we can make a difference.

And Grove Enterprises is making the task easier, too, by offering a special SETI package including your choice of receiver, the feedhorn, low noise amplifier, and even the cabling for your SETI terminal.

What We've Heard So Far

Organized SETI has been going on for nearly forty years. About once or twice a year, we detect something strange, a signal which we just can't explain away. Unfortunately, none of these tantalizing candidate signals has yet proven conclusive. SETI demands the most stringent level of proof, if it is to answer the fundamental question which has haunted humankind since first we realized that the points of light in the night sky are other suns: *Are We Alone?*

The granddaddy of all SETI candidate signals was detected at the Ohio State University radio telescope in 1977. It is universally known as the "Wow!" signal, after the word scribbled in the margin of the computer printout when investigator Dr. Jerry Ehman first noticed it (see Figure 10). The "Wow!" was even mentioned in an episode of Fox TV's *The X-Files*. After over 100 follow-on studies, the "Wow!" has never repeated. But today's amateur SETI stations are *just as powerful* as the Ohio State facility was twenty-one years ago when the "Wow!" was detected. Thus it is our hope that, when enough

private SETIzens are up and running, the next "Wow!" will prove less elusive.

We've already had a few close encounters. The SETI League's *Project Argus* search of the heavens went on the air in April 1996, initially with just five observing stations (our overall plan calls for 5,000). Only three weeks later, two radio amateurs in England detected the anomaly seen in Figure 11. At first glance, this seemed to be just the sort of signal we'd expect from Beyond. It turned out to be a classified military satellite — beyond Earth to be sure, but hardly the ET we were seeking.

Our next interesting signal (see Figure 12) came from the 1.3 watt beacon transmitter aboard the *Mars Global Surveyor* satellite, clearly detectable at several million kilometers from Earth.

Such detections give us ample encouragement that our systems are up to the task of alien detection. Now all we need is enough participants around the world, coordinated through the Internet, so that no direction in the sky shall evade our gaze. You can be a part of a global net we're stretching to snag that slippery fish in the cosmic pond.

Finding Out More

Check out The SETI League, Inc., a membership-supported, nonprofit educational and scientific organization, on the Internet at <http://www.setileague.org/>. Leaders in the privatized search for life in space, The SETI League offers technical support, coordination, books, conferences, and a host of related activities for the aspiring SETIzen.

Our extensive web site (over 1500 documents totaling more than 50 megabytes, and



growing every week) is aimed at the dedicated amateur radio astronomer who's willing to learn. There you'll find sources for the hardware and software discussed above, along with hundreds of pictures showing how others have put their stations together. We have a technical manual to help you build (and even our own songbook for those who wish to sing SETI's praises).

For membership information, email your postal address to join@setileague.org, or drop us a line at P.O. Box 555, Little Ferry NJ 07643 USA. We Know We're Not Alone!

This feature is updated and reprinted from the May 1998 Satellite Times.

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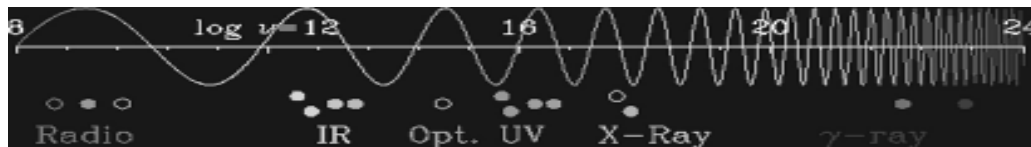
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Whispers from the Cosmos



By Larry Van Horn

It's a warm summer evening and you have some spare time to do a little radio listening. You walk into your radio room and sit down in front of your modest rack of equipment. Slowly you turn the dial of your favorite VHF/UHF communications receiver looking for something new to monitor.

Suddenly you notice an increase in the noise level on your receiver's S-meter. You quickly run through your computer frequency database to see what local or satellite targets are in the vicinity of your received signal. Finding nothing, you now swing your dish antenna a few degrees off its original position and notice that the noise source fades away.

Where is this increased noise level coming

from? What kind of signal has your dish antenna captured? The chances are good that you are hearing a signal from a distant galaxy or quasar — a whisper from the cosmos.

In the Beginning

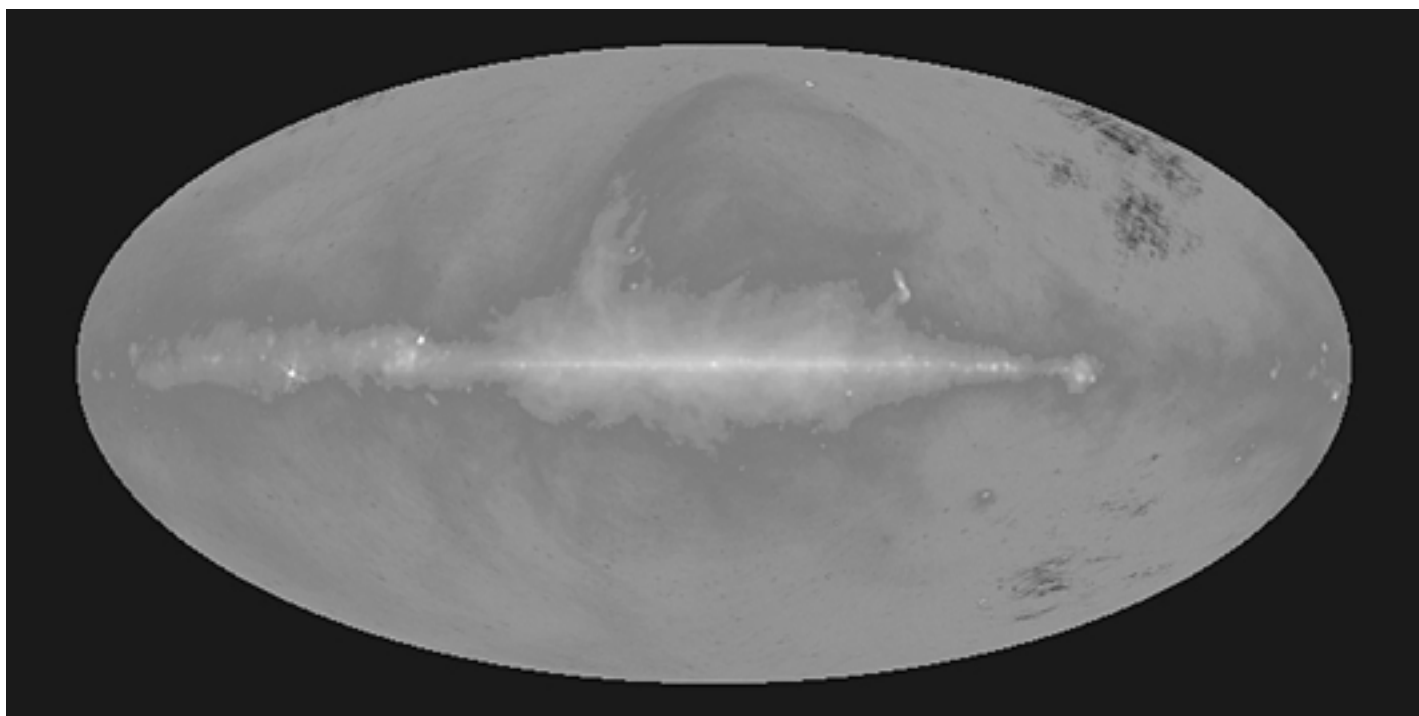
Many of the great discoveries of science have been made by accident. It was just such a discovery which launched the science of radio astronomy.

It all began more than half century ago when Bell Telephone assigned a noise-finding task to one of their engineers and physicist, Karl Jansky. The noise was a periodic disruption to the company's transatlantic ra-

dio links in the high frequency spectrum around 20.6 MHz.

Jansky constructed an elaborate rotatable directional antenna array (called the Bruce Curtain) and immediately discovered that all the noise originated from two sources: thunderstorms (local and distant) and an area of the sky near the center of the Milky Way Galaxy in the Sagittarius constellation.

These sources of terrestrial and cosmic noises were noted, and subsequent experiments by individuals occasionally took place. In 1937 another engineer, Grote Reber, built a parabolic reflector (dish antenna) in his back yard in Wheaton, Illinois, and began mapping the sky for radio emissions at 160



This survey is a mosaic of data taken at Jodrell Bank, Effelsberg and Parkes telescopes. The data was distributed in the "NRAO Images from the Radio Sky" CDROM. This image was generated by SkyView. Energy= 1.69×10^{-6} eV Frequency= 408×10^6 Hz (408MHz) Wavelength= 73.5 cm. (Credit: Max Planck Institute for Radio Astronomy, generated by Glyn Haslam)

MHz. He later determined that our own sun was a major source of radio emissions.

Over the next several decades, radio emanations (noise) from the Crab Nebula, Cygnus A, interstellar hydrogen, quasars (quasi-stellar radio sources), stars in the Milky Way and other galaxies, and even our own solar system (the planet Jupiter) have been pinpointed by radio astronomers.

But it is still noise, and who wants to listen to that?!

Radio astronomers do, and in recent years, amateur radio astronomers have also joined in the hunt. Receiving equipment costs have come way down, making it much more affordable for the amateur to join in on the fun. In fact, for the first time ever, a company called Radio Astronomy Supplies* has turn-key radio astronomy systems for sale to the general public.

The single largest contributing factor in the increased number of amateurs entering into the radio astronomy field is the power of home personal computers. The personal computers of today have the power and speed that are needed in order to do meaningful radio astronomy work.

Where Do You Listen

The single most common question I get asked is, "Where do you listen for cosmic signals and what are you listening for?" In the many references I have read over the years, they really never answer that question. Looking at official International Telecommunications Union (ITU) and Federal Communications Commission (FCC) tables of allocations, you will find radio astronomy bands scattered throughout the radio spectrum. But what are the radio astronomers listening to on these frequencies?

Table one (see page 16) gives you a complete breakdown of those radio astronomy bands and what is being heard on them. With this resource, the amateur will find quite a few interesting targets to observe and explore in the invisible universe of radio astronomy world.

What Can the Amateur Contribute?

You may be surprised to learn the opportunities for significant discovery are practically infinite. But how can this be so?

- Large observatories, to justify their huge cost, usually look at very remote sources with very narrow beams for very short periods of time. They cannot — by virtue of their design

— monitor large sky areas like amateur radio astronomers can.

- The amateur has something else going for him that the professionals lack — unlimited time that he can devote to a single observing program.

- Modern state-of-the-art equipment and inexpensive computers enable amateurs to do useful and viable work, when it is pursued with intelligence and attention to detailed data.

- Just as the patient visual amateur astronomer is likely to discover a new comet or asteroid, likewise the amateur radio astronomer is most likely to discover a new radio source or one whose flux output has changed radically.

Some Opportunities for the Amateur

Our own solar system offers all sorts of interesting exploration. Emissions from Jupiter are quite easy to monitor and this work has by no means been "mined out" by the professionals. Equipment as simple as a short-wave receiver, a quiet spot in the 20 MHz band, and a dipole antenna are all that is

required to hear the Jovian planet.

Our own sun, as close as it is to us and as vital as it is to our existence, isn't fully understood in all of its mechanisms. Every single bit of information we have gathered about the sun has been derived from events occurring on its surface. Aside from the idea that the power source involves a nuclear furnace in its interior which converts hydrogen to helium, we haven't the foggiest notion of what's really going on. Valuable radio observations of the sun may be done with minimal and inexpensive radio receivers and antennas.

On average, a supernova can occur in our own galaxy every 10 to 30 years. If such an event occurred right now, would we see it? Probably not. If the nova occurred along the galactic equator, it would not be visually seen due to interstellar dust. However, the nova would stand out as a new radio source, radiating powerfully in the radio spectrum. It would be easily detected with a simple interferometer radio telescope.

Even strong signals from the center of our galaxy are quite easily detected with minimal radio equipment. These signals remain a mystery. There could quite possibly be from a black hole at the heart of our galaxy. These strong pulses have been recorded by amateur radio astronomers.

So turn on that radio and aim that antenna toward the sky. A whole new universe awaits you — the invisible universe of radio astronomy. You could be part of an ever larger group of amateurs looking for "Whispers from the Cosmos" if you are willing to take up the challenge.

This feature originally appeared in the May 1998 Satellite Times. The author is deeply indebted to the Committee on Radio Astronomy Frequencies and Jeffrey Lichtman for their assistance in preparing this feature article.

* Radio Astronomy Supplies, 190 Jade Cove Drive, Roswell, GA 30075. 770-992-4959; www.nitehawk.com/rasmit/ras.html



Grote Reber poses with his original dish antenna at the National Radio Astronomy Observatory in Green Bank, West Virginia. (Photo courtesy of the NRAO)

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TABLE 1: Radio Astronomy Bands

Unless otherwise indicated all frequencies are in MHz.

13.36-13.41	This band is very important for observations of decametric radiation from the planet Jupiter and from the Sun.
25.55-25.67	This band is very important for observations of decametric radiation from the planet Jupiter and from the Sun.
37.00-38.25	This band is very important for research of radiation from Jupiter. Long after all the decametric frequency bands have been allocated and widely used by active services Jovian decametric radiation was discovered. The allocations to the radio astronomy service are extremely narrow since the interesting Jovian phenomena can cover the entire spectrum from 3-40 MHz.
73.00-74.60	ITU Region 2: Observations of emissions from the Sun (solar wind), Jupiter, stars, galaxies and interstellar clouds.
79.25-80.25	This band is used for monitoring the interplanetary "weather" structure in the solar wind by an international network of instruments.
150.05-153.00	ITU Region 1: This band is widely used in the United Kingdom and is a major band for the Giant Meter wave Radio Telescope (GMRT) in India. Also used for pulsar observations and solar observations.
322.0-328.6	Observations of pulsars (not allocation as passive only band): This band has the desired octave-spacing relation with the 150.05-153 MHz and 608-614 MHz bands, which is needed for continuum observations and in addition it contains an important atomic spectral line—the hyperfine- structure spectral line of deuterium at 327.384 MHz.
406.1-410.0	Observations of pulsars (not allocation as passive only band)
420.0-450.0	Arecibo Observatory, Puerto Rico radar and astronomy observations (not allocation as passive only band)
430.0000	National Astronomy and Ionospheric Center and Cornell University planetary research radar (part of Arecibo Radio Astronomy Observatory in Puerto Rico).
608.0-614.0	Very Long Baseline Interferometry (VLBI) for observing sources such as pulsars. (US TV channel 38 receive only scientific band)
1330-1400	Observations of Doppler-shifted radiation from hydrogen in galaxies
1420-1427	This band is the most important band for studies of the hydrogen line at 1420.4060 MHz and for continuum observations. 1420-1660 MHz also used for SETI survey programs.
1610.6-1613.8	This band is an important band for Hydroxyl radical (OH) line observations and is used in conjunction with the main OH bands in the next higher OH-band (1660-1668.4 MHz).
1660.0-1668.4	Observations of the Hydroxyl radical (OH) spectral line which is important for understanding interstellar medium and star formation in galaxies. In addition this band is used for continuum observations and also for VLBI.
1718.8-1722.2	Secondary allocation internationally for observation of hydroxyl radical spectral line.
2290.0-2300.0	Very Long Baseline Interferometry and NASA Deep Space Network
2320.0000	NASA's Solar System Radar in Goldstone, California
2655.0-2700.0	This band is primarily of interest for the study of continuum emission of radio sources. The spectral region 2655.0 to 2700.0 MHz is a good band for continuum measurements partly because the galactic background radiation is low, and also because radio astronomy receivers are of excellent quality and have very low noise at such frequencies.
2690.0-2700.0	Observations of galactic and extragalactic radio sources. Solar observations by the Air Force Solar Telescope Network.
2800.0000	Daily solar flux index is measured from Ottawa, Ontario, Canada on this frequency.
3260-3267	Three molecular lines of the CH molecule have been detected at 3263, 3335 and 3349 MHz. The study of interstellar CH is considered to be extremely important in understanding the chemistry of the interstellar material. The presence of CH suggests the existence of the molecule CH ₄ (methane) which is considered one of the basic molecules for the initial stages of the formation of life.
3332-3339	Three molecular lines of the Methylidyne molecule (CH) have been detected at 3263.794, 3335.481 and 3349.193 MHz.
4800-5000	The spectral region around 5 GHz has been one of the widely used frequency ranges in radio astronomy during the last decade. One of the most important uses of the band around 5 GHz is the study of the formaldehyde (H ₂ CO) interstellar clouds at 4829.66 MHz. The H ₂ CO line at this frequency is considered to be one of the most important radio lines in the entire spectrum, primarily because it can be detected in absorption in almost any direction where there is a continuum radio source.
4990-5000	Used to observe the distributions of brightness of objects in our galaxy and others, radio maps of interstellar clouds and supernova remnants. This area of the spectrum has a low level of galactic background continuum radiation. This band is also used for Very Long Baseline Interferometry (VLBI).
6650-6675.2	This band is important for observations of Methanol (CH ₃ OH) which is an important tracer of star formation activity.
8510.000	NASA's Solar System Radar in Goldstone, California (1 Megawatt of power)

All frequencies below this point are measured in GHz.

10.60-10.70	The frequency band 10 to 15 GHz provides some of the best angular resolutions (~2 arc minutes) using many large and accurate radio telescopes. This high-frequency range is also important for monitoring the intensity variability of the enigmatic quasars. The energy emitted during any one burst from a quasar is equivalent to completely destroying a few hundred million stars in a period of a few weeks or months.
14.47-14.50	At 14.4885 GHz, an important formaldehyde (H ₂ CO) line exists, which has been observed in the direction of many galactic sources.

15.1365-15.35	Radio astronomy band (shared)
15.35-15.40	Observations of quasars (passive receive only band): The small sizes of the quasars are revealed from the VLBI observations mentioned earlier (10.6-10.7 GHz). Such observations are also being made in the frequency band 15.35-15.40 GHz. The higher frequencies provide us with better angular resolution and enable us to determine more accurately the sizes and structure of quasars.
22.21-22.50	Used by radio astronomers to measure distances to far galaxies and Very Long Baseline Interferometry (VLBI). The band 22.01-22.21 GHz is of importance in conjunction with the adjacent band (22.21-22.5 GHz) for observations of redshifted H ₂ O.
22.81-22.86	This band is of importance for studies of a non-metastable ammonia line and two lines of methylformate.
23.07-23.12	This band is of special importance for studies of ammonia lines. There is a highly interesting methanol maser line immediately above the protected band at 23.121 GHz.
23.60-24.00	The band is used for observations of the main ammonia band in the interstellar medium and also important for continuum observations and for observations of a number of other spectral lines.
30.00-106.00	The new Millimeter Array (MMA) will help scientists understand the age of the universe; image distant galaxies/pre-planetary structures; measure the properties of subsurface layers of asteroids; and probe the outflows from thousands of stars, among other possibilities. The US-Mexican Large Millimeter Wave Telescope (LMT) will also use this frequency range.
31.10-31.80	This band is a continuum band.
36.43-36.50	This band is of importance for the search for HC ₃ N and OH lines.
42.50-43.50	The frequency region between 42.5 and 49 GHz contains important spectral lines of some diatomic and other molecules. The lines of SiO indicate maser emission. Other molecules detected in this frequency range include H ₂ CO, CH ₃ OH and OCS.
47.20-50.20	(See 42.50-43.50 GHz above)
48.94-49.04	Observations of molecular material in galaxies
51.40-54.25	This is an important radio astronomy band in the series of continuum bands.
58.20-59.00	(See 51.40-54.25 GHz above)
64.00-65.00	(See 51.40-54.25 GHz above)
86.00-92.00	This is an important radio astronomy band for continuum measurements and contains several natural lines, two of which are considered of special importance (see Table 2 for a complete list)
92.0-95.0	The band is important for many spectral lines including diazenylium (HNN+) (rest-frequency = 93.174 GHz).
95.0-100.0	This frequency range is important for its "forest" of molecular spectral lines: The primary allocation for the band 97.88-98.08 GHz has the carbon monosulphide (CS) spectral line (rest-frequency = 97.981 GHz).
100-102	Radio astronomy band
101-120	SETI survey programs
105-116	This is one of the most important bands in the radio frequency spectrum, at least equal in importance to the hydrogen line band 1400-1427 MHz. The band contains many spectral lines, in particular the lines of carbon monoxide and its isotopes (CO) at 109.782, 110.201, 112.359 and 115.271 GHz which are not only the most powerful tool in the study of isotope ratios, but are also essential in the study of cool clouds, regions of star formation and structure of our Galaxy and other galaxies.
116-126	Observations of ozone, carbon monoxide and nitrous oxide
140.69-140.98	This band is 300 MHz wide centered on 140.839 GHz, which is the rest-frequency of Formaldehyde (H ₂ CO).
144.68-144.98	This band is 300 MHz wide centered on 144.827 GHz, which is the rest-frequency of Deuterated Hydrogen cyanide (DCN).
145.45-145.75	This band is 300 MHz wide centered on 145.603 GHz, which is the rest-frequency of Formaldehyde (H ₂ CO).
146.82-147.12	This band is 300 MHz wide centered on 146.969 GHz, which is the rest-frequency of Carbon monosulphide (CS).
150.0-151.0	This band is 300 MHz wide centered on 150.498 GHz, which is the rest-frequency of Formaldehyde (H ₂ CO).
160.0000	Cosmic background radiation from the Big Bang peaks around this frequency
164.0-168.0	This band is used for continuum observations.
174.42-175.02	Frequencies in the 174.0-182.0 GHz range contain useful lines for radio astronomy at 174.6, 174.85, 177.26, 178.4 and 181.2 GHz.
177.0-177.4	(See 174.42-175.02 GHz above)
178.2-178.6	(See 174.42-175.02 GHz above)
181.0-181.46	(See 174.42-175.02 GHz above)
182.0-185.0	This band contains important lines of water vapour at 183.31 GHz and ozone at 184.75 GHz.
186.2-186.6	In the band 185-200 GHz, the subband 186.2-186.6 GHz is used for observations of a spectral line of diazenylium.
197.0-220.0	SETI survey programs
217.0-231.0	The most important millimeter wave radio astronomy band. Observations of carbon monoxide, nitrous oxide and other complex molecules in gas within galaxies. Also used for observations of broadband noise from cosmic background radiation associated with the Big Bang (peaks around 160 GHz). The relevance of the band 217-231 GHz is that lines of carbon monoxide (CO) at 219.560, 220.399 and 230.542 GHz need to be observed in conjunction with CO lines in the band 105-116 GHz.
265.0-275.0	This band contains a very important series of spectral lines of the molecules C ₂ H (262.5 GHz), HCN hydrogen cyanide (265.9 GHz), HCO+, formalyl (272.0 GHz).
300 and above	Not yet allocated but supposedly widely used for radio astronomy work.
500.000	NASA's Submillimeter Wave Astronomy satellite will observe astrochemical phenomena near this frequency.



Picture received by ZS6BTD near Johannesburg, South Africa



Picture received by WB6FZH/KH6 over Hawaii

The *Mir* space station, which was due to be scuttled in August, has received an indefinite reprieve, but the uncertainty of how long it may be manned makes this story of particular interest. Since December 1998, exciting pictures of excellent quality are being sent on a two-day schedule from inside *Mir* as it orbits the Earth. These pictures are transmitted via SSTV (Slow Scan Television), a first for *Mir*, as well as an historical event for both amateur radio and the space station.

The idea to put an SSTV System aboard *Mir* originated almost two years ago between Farrell Winder, W8ZCF, and Dr. Don Miller, W9NTP. Through the assist of Dr. Dave Larsen, N6CO, and Miles Mann, WF1F, contact with Russia and eventual approval for a "go" was given. This approval was made by Sergej Samburov, RV3DR, Chief of the Cosmonaut Amateur Radio Department RSC (Rocket Space Corporation) "Energia" in Moscow.

No packaged equipment existed in suit-

able functional form to meet the *Mir* application. Neither were any funds available for equipment. Sponsors who generously supplied the necessary equipment were Tasco Electronics, Kenwood Corp, Picture Tel Corp, and Apple Computer.

To relieve the cosmonauts of the need to manually operate the equipment, an automated mode of operation was incorporated. Hank Cantrell, W4HTB, joined the group to design and fabricate an auto controller, which provides a CW tone ID and an automatic sequencing of the equipment to provide a new picture in Robot 36 mode every two minutes, now yielding 720 pictures per day around the world! Don, Farrell and Hank assembled and tested the finalized packages.

Four systems were produced for testing and spares. Two airborne tests were done by Chris Scott, WB9NEQ, using his airplane with Hank as copilot. Both uplink and downlink tests were accomplished with excellent pictures both ways.

The equipment was delivered aboard *Mir*

in November 1998 and commenced transmitting pictures to Earth on December 12. The downlink frequency is presently **145.985 MHz FM**.

Mir was, as of Feb 1999, sending pictures two days per week, on Sunday and Monday. It is expected at a later date to move to **437.975 MHz FM** and run on a more continuous basis. Earth stations should now be able to become more closely acquainted with *Mir*. Educational facilities should especially benefit as contacts are made with students who will also be able to learn more about *Mir* and space.

Further details of the evolution of this amateur radio SSTV project, and the training of the cosmonauts by Miles Mann in Moscow may be found at:

http://www.geocities.com/CapeCanaveral/Hangar/7355/sstv_proj.htm

Several of the exciting pictures, typical of those being currently received from *Mir*, orbiting 226 miles above the Earth, are shown in this article.



SSTV System in operation on board Mir - This equipment consists of a "Docking Station" which incorporates a Tasco TSC-70 color scanner, a 5 inch LCD TV screen, and a Kenwood TM-V7 FM transceiver. The auto controller is shown on top of the assembly, a remote control is shown to the left and camera on the right. (A small PictureTel camera with zoom feature is also used)



Sergej Samburov, RV3DR, Cosmonauts Sergei Avdeyev and Gennadiy Padalka discussing SSTV system in Moscow

without saying that, today, most pictures are in color.

Slow scan used to be found primarily on HF on 14.230 and 14.233; but now many SSTV nets (and *Mir*) can be found on VHF. You can find a list of VHF nets at <http://www.ultranet.com/~ssstv/vhf.html>

WHAT IS IT?

Slow scan TV can best be described as fax pictures sent over the radio. The pictures are transmitted via tones (1200-2300 Hz) over the air.

It's no longer necessary to buy expensive, special use hardware to send or receive images — but you do need a ham radio license to transmit. There are several simple ways to get set up for slow scan TV, the simplest of which use your computer and software with a hardware interface. There are interface circuits which work well and cost less than \$20 to build. Commercial systems are also becoming more affordable.

The quality of the pictures you receive will vary, but the better systems give picture resolutions of almost photographic quality — it goes

Monitoring the Crisis in the Balkans

By the *Monitoring Times* Staff

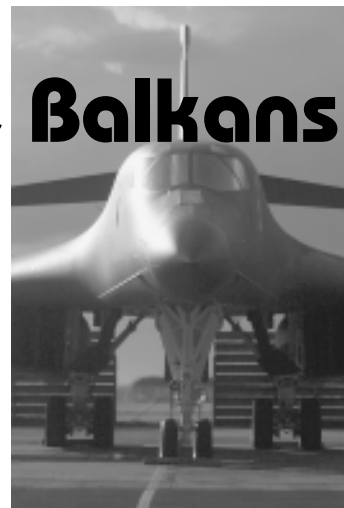
As the NATO military response in Serbia/Kosovo continues, the staff of *Monitoring Times* magazine has put together a list of active frequencies associated with the conflict. This will help listeners equipped with HF radios and VHF/UHF scanners keep tabs on the action.

On our broadcast list we have included all known English language broadcasts on shortwave from Serbia and the surrounding countries. We have added HF utility and VHF/UHF military communications frequencies that have been positively identified as being associated with Kosovo operations.

Schedules for all other shortwave stations worldwide carrying English language broadcasts can be found in the English language shortwave guide in the center of this magazine.

We want to extend a special thanks to Gayle Van Horn, the entire *MT* shortwave broadcast monitoring team, and dozens of other monitors from around the world for their help in developing the comprehensive frequency information presented here. As always, if you have something you would like to contribute, please contact us at the email addresses at the end of this piece. This article is posted on the *Monitoring Times* website and is constantly updated.

All times are UTC and all HF frequencies are in kHz. VHF/UHF frequencies are in MHz.



(Photo by Senior Airman Jeff Fitch)

Table 1: English Language Shortwave Broadcasts from the Balkans

Radio Tirana International, Tirana, Albania

UTC	Freqs (kHz)	Target area	Schedule
0145-0200	6115/7160	North America	daily
0230-0300	6115/7160	North America	daily
1915-1930	7180/9510	Europe	daily
2130-2200	1215/7160/9635	Europe	daily

Radio Bulgaria, Sofia, Bulgaria

0200-0300	9400/11700	North America	daily
1100-1200	15700/17500	Europe	daily
1900-2000	9400/11720	Europe	daily
2100-2200	9400/11720	Europe	daily
2300-0000	9400/11700	North America	daily

Croatian Radio, Croatia

0705-0710	9830	Europe	Monday-Friday
	13820	Africa	
0805-0810	9830	Europe	Sunday
	13820	Australia	
0905-0910	13820	Africa	Monday-Friday
1305-1310	6130	Europe	

Radio Prague, Prague, Czech Republic

0000-0027	11615/13580	North America	daily
0100-0127	7345/11615	North America	daily
0200-0230	Via WRN Galaxy 5 Satellite, transponder 6, 6.80 MHz audio		
0300-0327	7345/9955/11615	North America	daily
0330-0357	11600/15530	Middle East/Asia	daily
0700-0727	9880/11600	Europe	daily
0900-0930	Via WRN Astra 1B Satellite		
	21745	Africa/Asia	daily
1030-1057	9880/11615	Europe	daily
1300-1327	13580/17485	Europe/Asia	daily
1600-1627	5930/21745	Europe/Africa	daily
1700-1727	5930/21745	Europe/Africa	daily
2000-2027	5930/11600	Europe/Asia/Australia	daily
2130-2157	11600/15545	Africa/Asia/Australia	daily
2230-2300	11600/15545	North America	daily

Voice of Greece, Athens, Greece

0140-0150	7450/7475/9375/9420	North America	daily
0250-0300	7450/7475/9375/9420	North America	Sunday/Friday
0340-0350	7450/9375/9420	North America	daily
0700-0715	7430/7450/9375/9420	Europe	Friday
	9775	Australia	
0730-0740	7430/7450/9375	Europe	daily
	9420	North America	daily
	9775	Australia	daily
1240-1250	15630	Africa	daily
1410-1420	7450	Europe	daily
	9425	North America	daily
1800-1815	7450/9425	Europe	daily
	15485	North America	daily
	17705	South America	daily
1840-1850	12105/15630	Africa	daily

1900-1910	7475/9375	Europe	daily
2240-2250	7475/9425	Australia	daily
2340-2350	7450/9400/11645	South America	daily

Radio Budapest, Budapest, Hungary

0100-0130	9560	North America	daily
0230-0300	9840	North America	daily
1900-1930	6025/7170	Europe	daily
2100-2130	6025	Europe	daily
2130-2200	975	Europe	daily

Radio Romania International, Bucharest, Romania

0200-0300	5990/9570/11830	North America	daily
	11740/11940/15380	Asia	
0400-0500	9570/11940	North America	daily
	15325/17720	Asia	daily
0600-0700	7105/9625/11775	Europe	daily
	9510/21480	North America	
	17790	Africa	daily
0641-0656	9550/9625/9665/11885	Europe	daily
0700-0800	17735/21480	Africa	daily
1300-1400	15335/17805	Europe	daily
	17745	North America	daily
1700-1800	9510/11940/15250	Europe	daily
2100-2200	7105/9550/9690	Europe	daily
2300-0000	6130/7195	Europe	daily
	9570/11830	North America	daily

Radio Slovakia International, Bratislava, Slovakia

0100-0130	5930/7300/9440	North America	daily
0700-0730	9940/15460/17550	Australia	daily
1630-1700	5920/6055/7345	Europe	daily
1830-1900	5920/6055/7345	Europe	daily

Radio Yugoslavia, Belgrade, Serbia

0000-0030	9580	Europe/North America	daily (except Sunday)
0430-0500	9580	North America	daily
1830-1900	6100	Europe	daily
	9720	Africa	daily
1900-1930	7230	Australia	daily
2100-2130	6100/6185	Europe	daily

Voice of Turkey, Ankara, Turkey

0300-0400	7240/9655/21715	Various	daily
1230-1300	15295/17815	Asia	daily
1300-1330	15295/17815	Asia	daily
1830-1900	9630	Asia	daily
	9655	Various	daily
1900-1930	9630	Asia	daily
	9655	Various	daily
2030-2100	9525	Various	daily
2100-2130	9525	Various	daily
2200-2300	7280	Europe	daily
	9655	Various	daily

Table 2: Operation Allied Force Active Frequencies

Freq kHz	Service and Use
3178	USAF EC-130 ABCCC Bookshelf Net Push Unknown (Moonbeam Ops)
3900	NATO E-3 AWACS Net (ITU Region 1 only) Magic/Cyrano callsign
4519	USAF EC-130 ABCCC Bookshelf Net Push 78A (Moonbeam Ops)
4724	USAF Global HF System Primary
4742	RAF STCICS "Architect"
5218	USAF EC-130 ABCCC Bookshelf Net Push 79B (Moonbeam Ops)
5763.5	USAF EC-130 ABCCC Bookshelf Net Push 80V (Moonbeam Ops)
6693	USN Adriatic Task Force Voice Coordination Net
6712	USAF Global HF System Primary
6728	NATO E-3 AWACS Coordination Net
6739	USAF Global HF System Primary/RAF STCICS "Architect"
6761	USAF Worldwide Air Refueling Primary
6865	USAF EC-130 ABCCC Bookshelf Net Push 81A (Moonbeam Ops)
6932.5	USAF EC-130 ABCCC Bookshelf Net Push 81B (Moonbeam Ops)
8046	USAF EC-130 ABCCC Bookshelf Net Push 81V (Moonbeam Ops)
8087	USAF EC-130 ABCCC Bookshelf Net Push Unknown (Moonbeam Ops)
8982	USN Adriatic Task Force Voice Coordination Net
8992	USAF Global HF System Primary
9118.5	USAF EC-130 ABCCC Bookshelf Net Push 82A (Moonbeam Ops)
9260	USAF EC-130 ABCCC Bookshelf Net Push 82B (Moonbeam Ops)
10315	NATO Naval Voice Coordination Net
10915	NATO/SFOR Airlift Interplane "JG" callsigns
11173	USAF EC-130 ABCCC Bookshelf Net Push 83A (Moonbeam Ops)
11175	USAF Global HF System Primary
13200	USAF Global HF System Primary
13458	Raven Operations (Frankfurt/Rhein-Main) working various tanker aircraft
15016	USAF Global HF System Primary
15048	USAF EC-130 ABCCC Bookshelf Net Push Unknown (Moonbeam Ops)
16442.4	Naval Voice Coordination Hotel Tracking Net



An F-15E Strike Eagle launches from Aviano Air Base, Italy, in support of Operation Allied Force. Deployed here from RAF Lakenheath, England, the Strike Eagles have been putting bombs on target during NATO air operations over the Federal Republic of Yugoslavia. (USAF photo)



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Table 3: NATO Common VHF/UHF Frequencies

Freqs MHz	Service and Use	Freqs MHz	Service and Use
122.1	NATO Common VHF Tower/GCA/Approach Control	282.0	USAF/NATO Air Tanker Air-to-Air
123.1	Search and Rescue (VHF Primary)	282.1	Search and Rescue (Secondary)
123.3	NATO Common VHF Low Level/GCA/Final Approach	282.350	NATO E-3 AWACS Net to Magic callsign
125.675	Scottish Control Radar	282.850	Fairford RAF Have Quick communications
127.275	Scottish Control Radar	282.8	Search and Rescue (Primary)
128.350	Dutch Military Radar	294.7	Rhein Radar (Germany)
130.425	Search and Rescue (Unicom)	294.8	USAF Air Refueling (Med)
134.3	Scottish Military Radar	299.6	USAF/NATO Air Tanker Air-to-Air
135.275	London Military Radar	299.975	London Military Radar
138.7	Search and Rescue (VHF Secondary)	300.0	Have Quick TOD frequency
142.225	Fairford RAF Tower	300.8	NATO Common Low Level
142.825	USAF Aircraft noted here in Fairford area	311.0	Military Tanker Common
156.3	Marine VHF Channel 06 (Air/Ship)	312.450	Mildenhall RAF Command Post "Banter Ops"/Fairford RAF CP (UK)
156.8	Marine VHF Channel 16 (Distress)	316.350	USAF Air Refueling (Med)
160.6	Marine VHF Channel 00 (Emergency)	317.1	USAF/NATO Air Tanker Air-to-Air
241.9	Helicopter Common	317.5	NATO Common Radar Fix
243.0	International Calling/Emergency (Worldwide)	333.550	USAF/NATO Air Tanker Air-to-Air (encrypted comms)
243.4	Guard/Watch	337.8	Transit Control
244.6	Search and Rescue (Scene of Search)	338.675	NATO E-3 AWACS Net to Magic callsign
249.475	Scottish Military Radar	344.0	NATO Common Radar/Director
249.750	Fairford RAF Command Post "Cajun Control"/Mildenhall RAF CP (UK)	344.1	USAF/NATO Air Tanker Air-to-Air
249.875	NATO Discrete Operations	349.3	NATO E-3 AWACS Net to Magic callsign
252.8	Search and Rescue (Training)	356.4	Jamming/Strike Safety
257.750	Fairford RAF Control (UK)	362.3	NATO Common Approach Control
257.8	NATO Common Tower	369.1	Helicopter Common
258.4	USAF/NATO Air Tanker Air-to-Air	370.950	Mildenhall RAF AMCC
264.875	London Military Radar	372.3	USAF/NATO Air Tanker Air-to-Air
275.925	NATO Maroon GCI	378.2	USAF/NATO Air Tanker Air-to-Air
277.8	US Navy Fleet Common	385.4	NATO Common Radar/Final Approach
278.3	Helicopter Common	390.975	USAF Military Aircraft Air-to-Air
279.4	Combat Scene of Action	391.0	USAF/NATO Air Tanker Air-to-Air
280.6	Jamming/Strike Safety	415.350	Fairford RAF Operations

Table 4: NATO E-3 AWACS "Magic" HF Frequencies

Channel	Freq kHz
??	3900
??	5691
??	23214
A4	8980 (See XD)
A9	10315
AA	6700
AB	11228
AC	8971
KD	6760
KF	6695
NB	3081
NC	3225
NE	4542
NF	4720
NH	4758
NI	6762.5
NJ	8986.5
NK	11270.5
NL	15050
NM	17996.5
XC	6754
XD	8980
XE	10315

According to some European sources the X-designators/frequencies are replacing N-designators/frequencies although the N-designators are sometimes still used.



Aircrew members from the 43rd Expeditionary Electronic Combat squadron, Davis-Monthan AFB, AZ, board their EC-130 as they prepare to take part in an Operation Allied Force mission. The unit is forward deployed to Aviano Air Base, Italy. (Photo by Master Sgt. Keith Reed)

Miscellaneous NATO HF Frequencies

3097.5 4777.5 5267.0 5349.0 (NATO Training Net 661G)

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193rd Special Operations Wing Pennsylvania Air National Guard



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The 193rd's Airborne Broadcasting Station

By Hans Johnson

Pennsylvania Air National Guard photos by Master Sgt. Dave Hawkins. All others by the author.

The 193rd Special Operations Wing, “The Voice of the Quiet Professionals” became known to the world in 1989, when it was partially declassified as the era of shrinking defense budgets commenced. The aircraft and personnel of the 193rd are today busier than ever, and while the highlights of some of the missions are known, much remains to be told about this unit.

UNIT AND PERSONNEL

The 193rd is a descendent of a Pennsylvania Air National Guard unit that was formed after the Second World War. While the Air Force wanted an airborne broadcasting station in the mid-1960's, they weren't sure whether it should be an active duty unit. Faced with a downsizing at the time, the Air National Guard volunteered to take on the mission. Flying EC-121s, the unit had its first mission in 1970 in Vietnam. The unit served in Grenada, Panama, Iraq, Haiti, and Serbia. The 193rd remains a one of a kind, the only unit of its type in the world. Yet it remains a guard unit made up mostly of part time personnel rather than full timers. This presents challenges but has advantages, too.



Tech Sgt. Dave Wells at work

(Pa ANG photo by Master Sgt. Dave Hawkins)



The HF antenna pod from which the wire antenna is deployed.

One big advantage is in aircraft maintenance. The unit's EJ-130E's were built in 1963. In a typical American Air Force unit, personnel are always coming and going so that at least part of the typical unit is pretty new. Not so at the 193rd. "We have maintenance personnel who have been here 20 or 30 years; they know the personalities of these aircraft," explains Technical Sergeant Ed Shank, public affairs specialist.

That same level of expertise also extends to doing the mission. "If we get a mission, chances are that I have already done it or I at least have a pretty good idea of how to pursue it electronically," explains Senior Master Sergeant Harold Bowman, who has 30 years of experience. Many others have 20 years of experience.

While this experienced cadre makes up about 25 percent of the unit, it must rely upon guardsmen for its remaining strength. Because of its unique nature, the 193rd is often

called upon to deploy to trouble spots. Yesterday it was Yugoslavia and Kuwait, it might be North Korea tomorrow.

Meeting this demand in an Air National Guard unit is a balancing act; after all, many of the personnel being called up have regular jobs. While the country needs them, their bosses also need them. The 193rd does its best to mitigate this on both sides. It only expects to be called upon when there is a significant need. Bosses' and Family Days provide a chance for education, demonstrating clearly the importance of the unit's mission and why unit personnel must be called away from work and home from time to time.

UNIQUE TRAINER

The demands on the aircraft are high. If they are on the ground, maintenance personnel want to work on them. If they are in the air, pilots need to get their training in.

Training in the air is very difficult — the noise levels are high and it's impossible to have a conversation. In response to this problem, the unit received a partial-task trainer (PTT) in 1994. The PTT is the mission part of the aircraft recreated exactly on the ground. Here they can train and practice their tasks without needing one of the actual aircraft to do so. Receivers, spectrum analyzers, and transmitters are all there.

SMSGT Bowman stresses that it is important to have the complete, exact system. "You wouldn't learn to drive a car with just the brakes or the steering wheel, would you?" he asks. There are also work stations for both the

vertical and horizontal antennas that the aircraft deploys.

It is in the PTT that personnel initially learn the systems, a process that takes about six months. Proficiency training also takes place in the quiet confines of the PTT.

J'S TO THE RESCUE

Even with the great mechanics the 193rd has, the aircraft themselves are nearing the end of their life. A new model of the C-130, the J, will replace the unit's current E models starting in 2001. The aircraft will be able to fly higher and faster, but mission equipment will remain much the same; it will simply be transferred to the new aircraft.

NEW MISSIONS?

Coming partially out of the 'black' in 1989 garnered the 193rd a lot of attention and a lot more missions. The 193rd stands ready and able to continue psychological operations in wartime. But if the last few years are



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Close up of HF receive antenna (above) and UHF/VHF antenna (below).



any indication, the line is increasingly blurred between war and peace, where American forces aren't fighting but are simply trying to keep the peace. The planned jamming of Serb television broadcasts is just one example.

There is also a growing humanitarian role for the American armed forces, and the unit believes that it has a role to play here, too, particularly given their ability to be on the scene of a disaster quickly. Citing the mid-1998 tidal wave disaster in Papua New Guinea that was made worse by poor communications, Lieutenant Colonel Bill Schaetzle, the operations support flight commander, stresses that they could have been on the scene quickly.

Recalling the Hurricane Andrew disaster of 1994, SMSGT Bowman adds, "We could have been on five FM frequencies after Hurricane Andrew."

Both added that they see the 193rd not as replacing other broadcasting assets, but rather as being first on the scene when communications are disrupted in a disaster. As other ground assets arrive, they can take over and the 193rd can go home. Such missions are more likely as the armed forces become more involved in peacekeeping and humanitarian missions and as more government and international agencies become familiar with the 193rd and its capabilities.

So keep your ear to the radio; if there is dramatic news somewhere, the 193rd and its transmissions may not be far behind.

Taking a Closer Look

The 193rd's many missions are run by a crew of one officer and five enlisted personnel. The typical mission is planned beforehand, but can be updated in flight. The unit relies almost exclusively on classified sources for mission planning, but it does buy about two dozen *World Radio TV Handbooks* a year. Here are some of the missions that can be performed by the unit's aircraft:

The EJ-130E (Commando Solo) as a flying radio and television station -

On shortwave a 10 kW transmitter is used, identical to those used in Air Force ground stations for years. It can operate from 2 to 30 MHz in a variety of modes. Its antenna is a trailing wire from the rear of the aircraft. It can be as long as 800 ft., but its specific length depends on the frequency being transmitted on.

On mediumwave (AM) a 10 kW transmitter made by Rockwell is used. It can operate from 450 kHz to 2 MHz in a variety of modes. Its antenna is a vertical extended from the bottom of the aircraft. The wire stays vertical thanks to about 500 lbs. of weight at its bottom. Length can be as long as 800 ft., but depends on the frequency being used.

On television, a single 10 kW is used. It is a one of a kind, capable of transmitting on channels from 2 to 69 in any television standard used in the world. There are two sets of antennas, one on each side of the plane. The set pointed towards the target is the antenna used.

On VHF/UHF, five 1 kW transmitters are used. They can operate between 30 and 1000 MHz from antennas located under the wings.

Programs on radio can be on cassette, reel to reel, or CD. There are also microphones for making direct broadcasts. These were used during Desert Storm by linguists onboard to make broadcasts to Iraqi troops. The aircraft have also picked up programs on shortwave and retransmitted them.

On-board software can predict the propagation for any of their antennas anywhere in the world.

The aircraft does not have the ability to relay satellite broadcasts yet, but there are plans to add that capability in the near future.

On television, the aircraft can play VCR and U-Matic tapes and Laser Disk. The format does not matter, as equipment on board the aircraft will convert it to the proper format.

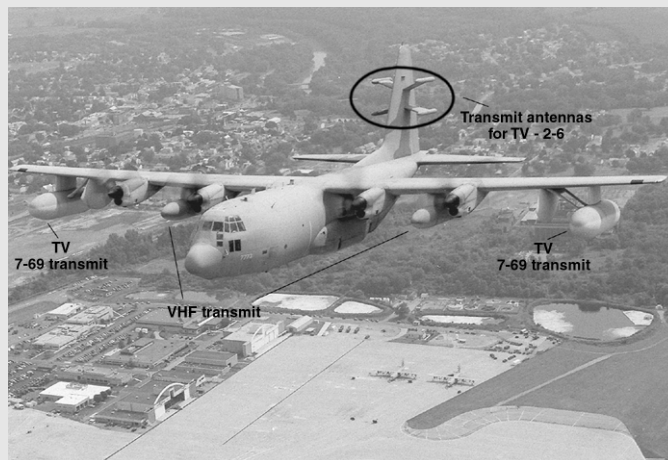
Each of the aircraft's four engines has a 90 kW generator, providing enough power for the transmitters and all the air conditioning needed to keep them cool.

The 193rd does not produce its own programs. Rather, many of them come from the Army's 4th Psychological Warfare Group at Fort Bragg.

The aircraft as a jammer (electronic attack) -

These same transmitters can be used for blocking or jamming someone's transmissions instead of broadcasting programs. Aircraft deployed near Yugoslavia in 1997 as a possible jammer of Serbian television. While this caused a bit of excitement at the time over the U.S. jamming, the unit has almost certainly performed this role or the very similar role of deception before. As an example, the 193rd "disrupted President's Noriega's ability to mobilize troops" during the 1989 invasion of Panama.

Other lesser roles include serving as a communications relay between military commanders and their units, and as a communications intelligence gatherer, using the aircraft's receivers.



An EC-130 flying over its base at Harrisburg. Duplicate sets of TV antennas allow the operators to choose the set facing the target.

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Connecticut on the Move

It was reported recently that the Connecticut State Police has finally come to terms with Motorola on their statewide digital trunked radio system. The state has been in the process of researching and developing strategies for implementation of a new radio system to replace their antiquated 42 MHz system that is over 50 years old. Recently, however, the state and the contractor were at loggerheads over coverage issues which have now been resolved.

State troopers are pleased that they will no longer need to use their cell phones to contact the dispatcher when occasionally out of range on their low-band system. State troopers in Connecticut have been using PAC-RT's (also known as Pac-rats, mobile extenders or vehicular repeaters) for portable coverage when out of the cruiser to help extend their range. These portable devices repeat all the low-band transmissions received by the cruiser radio to a low-powered handheld transceiver (HT). Similarly, everything transmitted by the portable is repeated out through the low-band channel using the 25 to 100 watt mobile radio.

Interestingly, these extenders use some of the first operational odd-split VHF channels in the nation — 7.5 kHz splits are now being licensed regularly.

High-Band Mobile Extenders

Frequency	Ch.	Use
154.6425	1	Mobile extender for 42.040
154.7025	2	Mobile extender for 42.360
154.6875	3	Mobile extender for 42.480
154.6575	4	Mobile extender for 42.520
154.8300	5	Mobile extender -selectable
154.8300	6	Mobile extender for 42.580

Each frequency uses a variety of PL/CTCSS tones. The combination of a multitude of frequencies as well as random PL tones helps to cut down on interference problems, particularly at the scene of an incident when more than one cruiser may arrive with their repeater active. Some extender systems have a first-on-scene priority operation whereby the repeater of the first unit to an incident will, by default, be the repeater that is used by all incoming units.

BearTracker scanners (BCT-7, BCT-12) key off of the mobile extender frequencies, including the odd-split channels used by the Connecticut State Police, to provide an alert of nearby activity. Mobile extenders typically operate at 1/2 of a watt up to 2 watts maximum. The limited range of the repeater actually provides the perfect level of alerting.

The new Connecticut State Police radio system was designed to use 54 tower sites statewide to insure coverage. The entire system will be connected via a new microwave network that should be nearing completion. The system may provide radio services for other agencies in the future. The first troops expected to switch to the new system include Troop G Bridgeport, Troop A Southbury, and Troop I Bethany, followed by Troop H Hartford and Troop W of Bradley International Airport. The following 20 channels will be used in the trunked system:

866.1375, 866.2750, 866.3000, 866.6125,
866.6375, 866.7125, 866.7500, 866.8625,
867.0750, 867.1375, 867.200, 867.2250,
867.5875, 867.7000, 868.1625, 868.2000,
868.3125, 868.5625, 868.6125, 868.7500

The preliminary plan is to assign five of the twenty channels to each troop as shown below.

Troop A Southbury

866.2750, 866.6375, 867.1375, 867.7000,
868.3125

Troop B North Canaan

866.1375, 866.6125, 866.8625, 867.2250,
868.6125

Troop C Tolland

866.1375, 866.6125, 866.8625, 867.2250,
868.6125

Troop D Killingly

866.3000, 866.7500, 867.0750, 868.1625,
868.5625

Troop E Montville

866.7125, 867.2000, 867.5875, 868.2000,
868.7500

Troop F Westbrook

866.3000, 866.7500, 867.0750, 868.1625,
868.5625

Troop G Bridgeport

866.7125, 867.2000, 867.5875, 868.2000,
868.7500

Troop H & W Hartford/Bradley International Airport

866.7125, 867.2000, 867.5875, 868.2000,
868.7500

Portions of the above is reprinted from the *Scanner Master Connecticut Pocket Guide* by Bill Cobb and Ed Soomre.

Nil-Jon Scanner Antenna Follow-up

The radically designed Nil-Jon scanner antenna has now been put to the test and has passed with flying colors (check out their recent ads in *MT*). This well-constructed antenna may look like a beam, but it's actually an excellent omnidirectional that meets or beats our personal favorite "all-band," the Diamond Discone, and it far exceeds the Monitenna on VHF and UHF. Note that we did not use any test gear to make these evaluations, just our own ear.

We've found that performance gains are particularly needed at our shack on VHF where the Nil-Jon proved a winner. The Nil-Jon was only equally as sensitive on 800 MHz as compared to the previously mentioned antennas. Other reviewers have had opposite results (the Nil-Jon outperformed its competitors at 800 MHz and provided equivalent performance on lower band). Overall we're very pleased with the Nil-Jon.

With an extensive instruction booklet, the antenna took twenty-five minutes to construct. While sturdy and good-sized (the boom is 67 inches long and the longest element is 90 inches in length), it remains relatively light (no more than 12 pounds) and easy to bring up a mast. It attaches easily



with stainless steel U-bolts and requires RG-6 coax and an F-connector.

One down side to the Nil-Jon is that it is bulky and slightly awkward looking as compared to the discone and the especially-sleek-looking Austin Ferret "stick." We did experience some very limited directionality to the antenna when side-tower mounted, but it was hardly noticeable and can be eliminated if mounted at the top of a mast.

The Nil-Jon also costs more than most consumer-grade antennas. However, what you're getting is an antenna with the quality and durability of a commercial product but at a much lower price tag.

In short, this wide-banded antenna provides higher performance using an efficient feed system and a relatively compact design at an affordable price. Overall, what we as scannists want is distance and the Nil-Jon provides that in spades. If you've heard all you can hear locally and want to expand your monitoring horizons, the Nil-Jon is worth a try.

You can read more about the entire line of Nil-Jon antennas at <http://members.xoom.com/niljon/antennas.html> and at www.nil-jonant.com

■ We have E-mail!

• Dick Keough writes: "A couple of weeks ago, I went to Castle Island, Massachusetts, to see the *USS Massachusetts* being towed out of dry-dock, heading back to Fall River. There was very little talk on the marine band in spite of all the movement in the harbor, but I noticed there were "spotters" stationed on the bow and stern of the ship, each holding a hand held radio and communicating presumably with the tugs involved in the towing operation. Someone had to be orchestrating this complex operation.

"Since I am frequently at that location where there is a lot of shipping action, I've been wondering what radio frequencies do the tugs normally use when communicating with the pilot on the bridge of any vessel entering or leaving the port.

"It would be logical that they would use an obscure marine frequency which would be readily available on every vessel without bringing radios aboard. Do you have any information on this?"

Dick, if this was a military operation, any number of frequencies could have been used. Because the spotters were communicating with tugs (presumably not navy or coast guard tugs), marine channels would be the most likely suspects. We have seen the

use of the following frequencies on board cruise ships:

457.525
457.550
457.575
457.600
467.750
467.775
467.800
467.825
467.850

Other possibilities would include one of hundreds of low-power UHF channels between 461 and 470 MHz. I might also have tried the new Family Radio Service channels (14 in all, wedged into the 462/467 MHz GMRS band starting at 462.5625). FRS radios are now available everywhere and provide a low-cost, efficient means of communications. If any of our readers have any other ideas, please send them in.

• Bill Petrowsky sent the following items for Ulster County, New York. There is an EDACS system in **Ellenville** licensed to NYCOMCO.

Ch #	Freq	Call
7	863.1875	WNMD318
6	862.1875	WNMD318
5	861.1875	WNMD318
4	864.1125	WPBD768
3	860.8875	WNFW641
2	858.8375	WNHB989 data
1	852.1625	WNMD318

Note that NYCOMCO maintains at least five EDACS systems in the Hudson Valley and some users can access multiple systems. Many public safety agencies use these systems. Blooming Grove PD in Orange County uses the Ellenville system. (The channel order shown will be required for programming of the new BC-245 Trunktracker.)

Kingston has an EDACS system, main-

tained by NYCOMCO. City police are on this system.

Ch #	Freq	Call
1	855.4875	WPIT704
2	858.7375	WPIT704 data
3	858.9875	WPIT704
4	859.7375	WPIT704
5	861.4375	WNPS671
6	862.4375	WNPS671
7	863.4375	WNPS671

Other area frequencies:

Freq.	Call	Use
151.010R	KGR397	Town of Ulster Highway Dept/PD ch 2, 156.105 input
153.770	WPKF464	West Hurley Fire
153.905	WPDE466	Saugerties Village local government
154.070	WPKF464	West Hurley Fire
154.100	WPKQ520	Town of Kingston Fire
155.490	WNKY266	Rosendale PD repeater, 153.740 input, CTCSS 110.9
155.955	KQL936	Ulster Co. public works
156.180R		Ulster Co. Highway Dept, 153.815 input
452.600	WPBP444	Hudson Valley Mall Maintenance
453.225R		Shawangunk local government.
453.275R	WNXQ709	Ulster County Infirmary
453.9375	WPBH203	Shawangunk Valley Fire
460.025	WNKR311	Shawangunk Police, 136.5
460.700	WPBP444	Hudson Valley Mall Security
Hurley Police are disbanded and 45.32 is not used.		
Marlboro PD are on Poughkeepsie EDACS now.		
Town of New Paltz PD is now on the Poughkeepsie EDACS system.		

• John Mayson was kind enough to send us the following mail: "Thanks for all the

HF-VHF-UHF Receiver Multicouplers & Preamplifiers

Are you using several HF radios or VHF/UHF scanners at your monitoring site??
....consider including a multicoupler or a preamplifier to your system.

SWL/Scanning - Radio Surveillance - News Rooms

Both our Passive and Active Multicouplers are commercial grade specially designed for demanding monitoring applications with multiple radios. Our 2 and 4 port couplers are 50 ohms units with better than 24 dB of port-to-port isolation. Active couplers feature wide-band Low-Noise distribution amplifiers with High-Pass/Low-Pass filtered inputs, BNC connectors standard.

Please visit our web site: <http://www.stridsberg.com>
for data sheet, application and ordering information.



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P.O. Box 5040
Shreveport, LA 71135-5040, USA.

Phone: (318) 861-0660
Fax: (318) 861-7068

Massachusetts freqs in the recent issues of *MT*. I travel to Westborough and Billerica every now and then on business. I'll now know what I'm listening to.

"Isn't Massachusetts one of those states where the state cops provide local law enforcement for towns that can't afford or choose not to have their own force? How do you know if a particular town is covered by local police or the 'Staties'?"

As Massachusetts has grown over the last 15 years, the State Police provide what they call "small town patrol" for fewer and fewer communities as many towns have started their own police force to handle increases in their population. The State Police still do provide police services for some of the "hill" communities in the central and western portions of the Commonwealth.

Interestingly though, the State Police now provide dispatch services for groups of small towns out of a central dispatch office, usually located in a State Police barracks. For the local municipalities, this is a wind-fall as they don't have to employ dispatchers. For the State Police, this allows them to stay much better informed as to the activity in the local towns.

Mayson also attached a list of **Austin, Texas**, frequencies, with this comment, "I discovered today that Capital Metro (Austin's city bus service) is a *great* source of traffic information. The dispatchers alert their drivers to accidents, congestion, etc. and suggest alternate routes."

Austin Police (in frequency order)

460.025	F7	Information
460.050	Simplex	
460.100	F2	Adam (Northwest)
460.150	Simplex	
460.175	F5	Charlie (East)
460.200	F10	Airport
465.225	F9	CID (simplex)
460.275	F6	David (Southwest)
460.325	F4	Edward (Northeast)
460.375	F11	Rangers
460.400	F1	Frank (Southeast)
460.450	F3	Baker (Central/West)
460.475	F12	Tac-3
460.500	F8	Info-2 Tactical

Austin Fire

153.950	Metro-3	Alerting
154.250		
453.100	Firecom-4	Airport
453.150	Firecom-2	Fireground
453.275	F7	Administration
453.450	Alarm-5	Dispatch
453.500	F3	EMS
453.675	Firecom-8	Airport
453.775	Firecom-1	Fireground
453.900	F6	Station Alert

Cap Metro

856.2125	F1	Buses/Dispatcher/Supervisors
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857.2125	F2	Special Services/Dispatcher
858.2125	F3	Private/Dispatcher/Supervisors
859.2125	F4	Dispatcher/Supervisors
860.2125	F5	Dispatcher/Maintenance/Supervisors
861.2125	F6	University of Texas Shuttle Buses

Trunked Radio System

Used by city owned water, sewer, and electric utility. Appears to be a Motorola Analog Type I system (E1P6).

Frequencies: 856.2625, 857.2625, 858.2625, 859.2625, 860.2625, 856.4375, 857.4375, 858.4375, 859.4375, 860.4375

Interesting Trends in Public Safety Communications

So much of today's car and its components now relies on high-tech computer chips that most car owners today can't troubleshoot and repair their automobiles as they did 25 years ago. As two-way radio equipment has similarly matured, it has often been assumed that public safety agencies — who oftentimes relied on the department's communications officer to oversee and maintain radio gear — would have to contract with outside agencies who specialize in such maintenance services.

Apparently that's not always the case. As so many of us are becoming more computer literate, so too are these police, fire and EMS officials who are in charge of their departments' radio systems. Given the combination of PC-to-radio programming tools and list-server discussion groups for radio gear, radio officers are actually better educated about their own equipment. While they may not necessarily service mobile, portable and base station equipment, they have become more involved in the design and maintenance of talkgroup plans for trunking systems, licensing of new frequencies, and the like. Similarly, these officers are reprogramming radios with a department's own frequencies as well as the frequencies of adjacent communities.

As part of this effort, we've been receiving anecdotal reports of police and fire officials randomly selecting unusual and (generally) unused channels for private chit-chat communications. At low-power, these channels do not have to be licensed. At high-power, they do require licensing, but their limited use makes them hard to attribute to a particular department.

For scanner buffs, this means that increased band-searching is required to determine where these transmissions may be lurking. Just as the new wildcard "PW" public

safety licenses are making it more of a challenge for hobbyists to determine how a frequency is being used by a community, now we also must contend with unlicensed operations as well. Luckily, the challenge of monitoring is what helps make it so much fun!

Communications News & Notes

- Nova Scotia, profiled recently in these pages regarding the emergency response to the downed Swiss Airliner flight, has reportedly agreed to upgrade their province-wide communications system to a digital trunked network to serve local municipalities as well as the RCMP (Royal Canadian Mounted Police). No word on an implementation schedule was available.

- The Massachusetts Bay Transportation Authority (MBTA) in the Boston area has put their new radio system out to bid. The system is spec'd to be a digital trunked system. Numerous 866-869 MHz channels have already been licensed. The MBTA, which is government operated and runs at a deficit just about every year, has been using a 470 MHz system for well over a decade.

While problems exist, the need for an all-digital trunked system is questionable. Getting a digital trunked system underground and providing coverage for buses in the city streets of Boston will not be an easy nor an inexpensive task. We'll keep you posted on the progress of the system.

- Dublin, a suburb of Columbus, Ohio, has just decided to implement an analog 800 MHz trunked system which will work well with the Columbus and Franklin County systems already in place in the region. The community used a consultant and, impressively, decided that a digital communications system was not necessary. Just about the entire Columbus region has been successfully operating on analog trunking for several years with little interruption in service. The city is hoping to implement the system this year.

- An anonymous report was provided to us on Indianapolis' "MECA" trunked radio system: The following changes have taken place in the system resulting from consolidation of talk groups. Field radios were reprogrammed about a month ago. In reference to the information found on the web site **Trunktracker.com**, under Marion County Fire: **delete** 9648 Dispatch South and **add** 8016 Dispatch; under Indianapolis Fire Department: **add** IFD/County Fire 8688 and **add** IFD/County EMS 3280.

Civilian Aeronautical Assignments

The Service Search column, inaugurated last month, is dedicated to “plug ‘n play” frequencies that will get you scanning in no time or which you can copy and save as a convenient reference. Last month we addressed VHF marine frequencies; this month we turn our eyes to the skies with nationwide aeronautical frequency assignments.

We remind you also that the *Monitoring Times* “Frequency

Exchange” has been resurrected on our web site (www.grove-ent.com/hmpgmt.html). In addition to frequency lists submitted by readers, you’ll also find spectrum allocation charts, FCC service codes, and other resource material.

Send suggestions for services you would like to see featured on this page to the Editor or email mteditor@grove-ent.com. Happy scanning!

National Civilian Aeronautical Band Assignments

Freqs MHz	Service and Use	Freqs MHz	Service and Use
108.000-117.950	VHF omni-range	123.075	Unicom (heliports)/U.S. Forestry Service helicopter (helispot) operations
108.100-111.950	ILS localizers	123.100	U.S. Coast Guard/Civil Air Patrol search and rescue
118.000-121.400	Air traffic control (towers/centers)	123.125	U.S. Air Force NAVAID flight check
121.500	Civilian aircraft emergency	123.125-123.475	Flight Test (Itinerant: 123.125/.150/.175/.400)
121.600-121.925	Ground control (25 kHz spacing)	123.200	Flight schools
121.950	Flight schools	123.300	Flight schools/balloons
121.975	Flight service stations (private aircraft)	123.400	Flight schools
122.000	Flight service stations (national flight watch-private aircraft)	123.450	Multicom (air-to-air informal)
122.025	Flight service stations (private aircraft)	123.500	Flight schools/balloons
122.050	Flight service stations (aircraft transmit)	123.525-123.575	Flight Test (Itinerant: 123.575)
122.075	Flight service stations (private aircraft)	123.600-128.800	Air traffic control (towers/centers)
122.100-122.675	Flight service stations (private aircraft transmit)	126.200	U.S. military control towers/ground controls
122.700	Unicom (uncontrolled airports)	128.625	NASA/NOAA research frequency
122.725	Unicom (uncontrolled airports-private aircraft only)	128.825-132.000	ARINC/Airlines company frequencies
122.750	Unicom (private air-to-air fixed wing)	132.025-135.975	Air traffic control (towers/centers)
122.800	Unicom (uncontrolled airports)	134.100	Military airports (ground controlled approach radar)
122.825	ARINC/Airline company frequency (aero enroute)	135.850	Federal Aviation Administration/U.S. Air Force/U.S. Army NAVAID flight inspection
122.850	Multicom/NOAA severe storms study aircraft/U.S. Forest Service helicopter operations	135.950	Federal Aviation Administration/U.S. Army NAVAID flight inspection
122.875	ARINC/Airline company frequency (aero enroute)	135.975	U.S. Forestry Service air-to-ground (wild-fires)
122.900	Multicom/U.S. Coast Guard search and rescue/U.S. Forestry Service fire cache air operations/Numerous government agencies and military services	136.000-136.075	Air traffic control operations
122.925	Multicom (plane-to-plane)/NOAA severe storms study aircraft/NASA research aircraft/National Park Service aircraft/Numerous government agencies and military services	136.100	Reserved for future unicom or automatic weather observation stations
122.950	Unicom (controlled airports)	136.125-136.175	Air traffic control operations
122.975	Unicom (high altitude)/U.S. Forest Service air operations	136.200	Reserved for future unicom or automatic weather observation stations
123.000	Unicom (uncontrolled airports)	135.225-136.250	Air traffic control operations
123.025	Unicom (helicopters/air-to-air)/U.S. Forestry Service helicopter (helispot) operations	136.275	Reserved for future unicom or automatic weather observation stations
123.050	Unicom (heliports)/NOAA severe storms study aircraft/U.S. Forestry Service helicopter (helispot) operations	136.300-136.350	Air traffic control operations
		136.375	Reserved for future unicom or automatic weather observation stations
		136.400-136.450	Air traffic control operations
		136.475	Reserved for future unicom or automatic weather observation stations
		136.500-136.875	Aeronautical enroute (domestic VHF)
		136.900-136.975	Aeronautical enroute (domestic/international VHF)

More Maritime Changes

This year's ongoing phase-in of the largely satellite-based Global Maritime Distress and Safety System (GMDSS) has Morse code (CW) stations dropping off like flies, especially on 500 kHz, where we've been copying farewell messages all year. Many of the European stations went away in February. Then in March, Cape Town, Port Elisabeth, and Durban, all in South Africa, bade a sentimental farewell.

Up on high frequency (HF) voice, the status of AT&T's High Seas Operator service remains in limbo at press time. Until satellites came in, this HF (high-frequency) network was the only way to call ships at sea, and today it's still a viable alternative for mariners on a budget. However, it's no longer a big money maker, and the phone company was all set to close KMI (CA), WOO (NJ), and WOM (FL) at the end of February. In April, though, these proud and historic stations remain temporarily on the air, while the US Federal Communications Commission sorts the mess out. It appears that WLO, in Mobile, Alabama, will ultimately fill some of this void in public radio-telephone coverage.

We've also had some changes in HF WEFAX. This stands for Weather Facsimile, a global network that broadcasts many different weather charts over an analog version of the digital fax common to offices.

The military is a big user of weather fax, but its current needs are being met by satellites. US Navy will fax on HF only with a request from the fleet, and Canadian Forces recently discontinued its faxes from 4266, 6454, and 12751 kHz. In order to serve the numerous civilians who still depend on this service, the US Coast Guard has actually been expanding its schedule in the last year or two. Table 1 shows the new frequency list

for the Coast Guard Comm Station in Boston, Massachusetts. This transmission fills a North Atlantic coverage hole left after the Navy ended weather faxes from NAM in Cutler, Maine.

Numbers Update

Gary Cohen knows Chinese, and he's been sending good loggings of New Star Broadcasting. This is a bizarre "numbers" station, probably in Taiwan, heard daily in AM (amplitude modulation). Winter skip made it a cheerful, if strange, little wake-up call for the western US on 8300 kHz most mornings.

Well, it turns out that New Star is all over HF. The 8300 kHz broadcast identifies as "New Star Radio, Fourth Service." There's a "First Station" on 11430 kHz, at 0500 and 0800. The "Third Service" uses 9725, and the Fifth is 13750. (I wonder where number two is?) These are all separate transmissions, not simulcasts. All but the 11 meg seem to go for hours, one thirty-minute segment at a time, at least from 1200 to 1600 UTC, maybe longer.

Each half-hour cycle is preceded by happy, tinkly music and one of those ultra-enthusiastic, Asian, female voices guaranteed to brighten up the day for any spook. "She" starts with the identifier and a group count, then another minute of tinkly music. This is followed by the very polite, "Please write down the following numbers," and usually messages in 4-number code groups. You haven't lived until you awake to mechanical numbers in Chinese. Finally, "she" thanks everyone for taking time out to get their secret messages. Spies need to be appreciated, too, after all.

Meanwhile, Camillo Castillo, in Panama, has discovered that the Cuban Morse code "cut" numbers station also has multiple broadcasts at times. This is the station that uses the letters ANDUWRIGMT to stand for one through zero. A lot of stations cut the



long number characters down to letters for brevity, but this particular sequence is quite distinctive. It's also a little strange.

Camillo's often hearing these broadcasts on two frequencies, but not in parallel, at 1200 UTC. One transmission ends with the usual Morse "AR AR AR SK" (End of message, end of work), but the other

ends "CCC SK." Perhaps this is a broadcast or transmitter identifier. See Table 2 for Camillo's loggings.

HWK7 Is Not French Navy!

For a long time now, everyone's been mystified, not to mention a bit flabbergasted, by HWK7, an erratic, Morse code (CW) transmission from Italy on 6997 or 6998 kHz. This callsign prefix is assigned to the French Navy, but no one copying these incoherent religious musings, sent in Italian, would believe that origin for a second. HWK7 gets reported a lot, because this frequency is right next to 40-meter amateur. It's used by many legitimate nets, not least among these the International Red Cross in Kosovo.

It's much more likely that the bootleg callsign was supposed to sound like The Vatican, which uses a block beginning with HV. This mistake is not surprising. According to a posting on WUN, the Worldwide Utility News on The Internet, the operator (perpetrator?) is a certifiable psychiatric case, who fancies himself a Catholic prophet. He says he's in Loretto, Italy, but the real source is unknown. The Twilight Zone, perhaps?

Table 1: New USCG Boston FAX Schedule

Time (UTC)	Frequencies (kHz)		
0230	4398.5	6338.6	9108.1
0800	4398.5	6338.6	9108.1
1430	6338.6	9108.1	12748.1
1720	6338.6	9108.1	12748.1
1900	6338.6	9108.1	12748.1

Table 2: Cuban Cut Numbers Station

Logged at 1200 UTC by Camillo Castillo All frequencies kHz, all transmissions CW			
Monday	6797	6982	
Tuesday	6933	7889 ("C" ending)	
Wednesday	6797	6854	
Thursday	6825	6933	
Friday	6866	6933	
Saturday	6797	6933	
Sunday	6768	6797	6997



Abbreviations used in this column

AFB	Air Force Base	LDOC	Long Distance Operational Control
AM	Amplitude Modulation	MARS	Military Affiliate Radio System
ARQ	Automatic Repeat Request teleprinter system	MFA	Ministry of Foreign Affairs
ARQ-E3	Single channel ARQ teleprinter system	NATO	North Atlantic Treaty Organization
CAMSLANT	Coast Guard Area Master Station, Atlantic	NAVTEX	Navigation Text
CG	Coast Guard	Pol-ARQ	ARQ scheme used by Polish embassies
CW	Morse code telegraphy ("Continuous Wave")	RAF	Royal Air Force
EAM	Emergency Action Message, coded military orders	RSA	Republic of South Africa
FEC	Forward Error Correction teleprinter system	RTTY	Radio Teletype
FM	Frequency Modulation	SAM	Special Air Mission
		UHF	Ultra High Frequency
		UK	United Kingdom
		Unid	Unidentified
		US	United States
		VHF	Very High Frequency
		VIP	Very Important Person

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time).

- 294.0 PH-French aero beacon, Cap d'Alpech, at 1112. (Ary Boender-Netherlands)
- 500.0 ZSC-Cape Town Radio, RSA, with farewell Morse Code signoff, then gone forever from this frequency, at 0000. (Bob Hall-RSA)
- 518.0 NMN-US Coast Guard CAMSLANT Chesapeake, VA, with NAVTEX bulletin in FEC at 1445. (Francis Donovan-MA)
- 3016.0 Air Force One-US Air Force, Presidential aircraft returning from King Hussein's funeral in Jordan, selcal and air traffic control with New York Radio, handed off to Gander on VHF. (Stonetower-NY)
- 3476.0 Gander Radio-North Atlantic air route control, Canada, telling Shanwick (UK) that he'll be on 6922 kHz until 4675 is fixed, at 0307. (Ron Perron-MD)
- 3494.0 Air France 5430-aircraft making patch through New York Radio for technical discussion of bad number 3 engine, diverted from Chicago to New York. (Stonetower-NY)
- 4448.0 SAM 201-US Air Force VIP flight, patch to SAM Command via Andrews VIP, at 0014. Also found on 6683, 8032, 9120, and 11220, 11226, and 13211 kHz at various times. (Jeff Jones-CA)
- 4495.0 WAR 46-US military Joint Alternate Command Post, PA, in signal check with Red Fern, at 0544. (Jeff Haverlah-TX)
- 4721.0 Headphone asked Andrews Global if that station could handle a digital message, was told to try Offutt, who probably couldn't take it either, at 0550. (Jones-CA)
- 4742.0 Ascot 3200-Royal Air Force, UK, with position report for Architect, at 0349. (Perron-MD)
- 5406.5 Bandbox-Dutch Air Force, Millingen, position with 8EG, at 1223. (Boender-Netherlands)
- 5692.0 Rescue 1500-US Coast Guard HC-130 enroute to a shipboard medical emergency, with patch to Atlantic Air Command Center at 0716. (Stern-FL)
- 5696.0 CAMSLANT Chesapeake-US Coast Guard, VA, sending Rescue 1500 to 5692 kHz for a phone patch, at 0714. (Stern-FL)
- 5841.0 Panther-US Joint drug ops, Bahamas, telling US Coast Guard aircraft 51A to land and unload contraband at "Golf 17" before gassing and returning to "Sector Z," at 0245. (Perron-MD)
- 6693.0 Air Force 2-US Air Force VIP flight, Vice-President aboard, with patch to Andrews Meteorological, at 0114. (Perron-MD)
- 6757.0 Absorbant-US military, working Pep Talk, then stayed on channel for big net lasting most of day, also using 11494, this logging at 1414. (Haverlah-TX)
- 6761.0 Adobe 80-US Air Force, air-to-air traffic with Adobe 51, 52, 61, 63, 71, 73, and 74, at 0354. (Haverlah-TX)

- 6766.0 Cuban CW cut numbers, parallel on 6797.1, at 1205. (Castillo-Panama)
- 6786.0 Cuban "Atencion" numbers, in AM at 0600. (Castillo-Panama)
- 6854.0 Cuban "Atencion" numbers, in AM, with very bad audio, at 0305. (Castillo-Panama)
- 6868.0 Unid-English-speaking male with numbers, in AM, at 0321. (Castillo-Panama) *Could be Russian intelligence. Cubans use this frequency at different times. Nice catch. -Hugh*
- 6993.0 SAM 375-US Air Force VIP flight, enroute to Hickam, working Andrews VIP, at 0615. (Jones-CA)
- 7391.5 NNN0NPF-US Navy MARS controlling "3XR5 Bravo Net" for AR, OK, and LA, at 2320. (Robert Thompson-US)
- 7831.0 WAR46-US military joint alternate command post, PA, calling Parts Kit, no joy, at 0620. (Haverlah-TX)
- 7889.1 Cuban CW cut numbers, on at same time as, but not parallel to, 6933, ended "C C C SK SK" instead of usual "AR." A transmitter ID? Began at 1200. (Castillo-Panama)
- 8122.0 Canberra Control, and Darwin Control, both Australia, working vessels, at 1200. (Perron-MD)
- 8135.0 Cuban CW "cut" numbers, at 1102. (Castillo-Panama)
- 8776.0 Lifeboat with EAM at 1915 and 1945. (Jones-CA)
- 8837.0 El Al Airlines LDOC, Israel, getting position and fuel status from aircraft, both speaking Hebrew, at 2220. (Perron-MD)
- 8861.0 Dakar-African and South Atlantic air route control, with Lufthansa 526 and Alitalia 682, at 0322. (Perron-MD)
- 8864.0 Gander-Gander Radio, Canada, North Atlantic air route control, relaying weather from Continental Dispatch to Continental 29, at 1422. (Perron-MD)
- 8933.0 Collins-Collins/Rockwell LDOC, Cedar Rapids, IA, with weather for unid aircraft, at 0450. (Perron-MD)
- 8968.0 War Hawk-US Air Force, with EAM simulcast on 11267 kHz, at 0037. Callsign that sounded like Block 85452 calling Hickam Global



- [oops -Hugh], no joy, at 0139. Pot Roast-US Air Force, with EAM at 0537. (Haverlah-TX) *This frequency has been removed from the Global High Frequency System, but it's still used for other Air Force traffic.* -Hugh
- 8971.0 Fiddle-US military P-3 ops, Jacksonville, FL, working Cardfile 71B (a P-3), at 1858. Cortez 713, trying to debug a crypto circuit with Fiddle, at 1950. (Stern-FL)
- 8977.0 Yeovil Ops, Yeovilton, UK, working Navy 632, 645, 674, 680, at 1009.
- 8978.4 USN, O-9-G, telling Habitat (NAS Whidbey Island) that another aircraft in the operation had one dead engine and problems with the other one, at 1829. (Jones-CA)
- 8983.0 CAMSLANT Chesapeake-US Coast Guard, VA, working CG aircraft W2T, relaying to CG Cutter *Escanada* (WMEC-907), at 2102. (Perron-MD)
- 8992.0 Jstars 03-US Air Force E-8C surveillance aircraft, patch through Thule regarding arrival at Patrick AFB, at 0328. Reach 5244-US Air Force C-141B, support aircraft returning with vehicles and personnel from a Presidential visit to Florida, getting weather and landing arrangements for Andrews AFB, at 0700. (Al Stern-FL) FAP-Portuguese Air Force headquarters, Lisbon, taking position from unid aircraft, at 2303. (Perron-MD)
- 9017.0 SAM 201-US Air Force VIP flight, signal check with Andrews at 0236. (Jones-CA)
- 9018.0 "45"-Aircraft working "46" with weather for Maxwell AFB, also using UHF frequencies of 342.5, 344.6, and 399.5 MHz, at 0545. (Jones-CA)
- 9031.0 Royal Air Force, Gibraltar, giving weather for locations in Brazil and South America, at 0340. (Perron-MD)
- 9120.0 "1103"-Aircraft calling Furious for a radio check, at 0101. (Jones-CA)
- 9120.0 Navy 50515-US Navy, leaving Lajes for Howard, working Andrews VIP at 0715. Also found on 11053, and 11220.0. (Jones-CA)
- 10780.0 Hops 86-US Air Force C-130, with patch via Cape Radio to Kelly Ops regarding arrival, at 2148. (Perron-MD)
- 10883.4 Stone Cold-US military, in large net with Puffin Control, Thunder, Lurch, and many others for the Urban Warrior exercise in CA, at 1800. (Jones-CA)
- 11175.0 Mark 47-Aircraft with inflight emergency for cabin pressure loss, attempting contact with Red Baron (Mildenhall RAF, UK), Ascension (US Air Force) had better copy, and jumped in to pass the traffic, at 0420. (Tom Carney, VA) "The Serb"-Unid jamming from heavily-accented, male voice in English, probably actually in Mid-east, breaking in on US Air Force patches with "Hands off Serbia," and "[Perform a human reproductive act], NATO," for first few days of Operation Allied Force. This logging was at 1511. (W.C. Godwin-US) Top 41-US Air Force, patch via Hickam, returning to base with hydraulic failure. (Stonetower-NY)
- 11178.0 Falcon 01-Dutch Navy aircraft, checking in with PJK, Curacao, at 2002. (Perron-MD)
- 11220.0 SPAR 06-US Air Force VIP flight, working Andrews at 0022. Trout 99 wkg Andrews VIP at 0539. SAM 204-US Air Force VIP flight, working Andrews VIP at 1636. (Jones-CA)
- 11232.0 Chalice Delta-US Air Force, with patch to Okie Sam via Trenton Military about format training on 228.8 MHz, at 1349. (AWACS aircraft out of Tinker AFB, OK. -Hugh) Trenton calling UN 399 (Canadian Forces aircraft on United Nations mission), no joy, at 2125. (Perron-MD)
- 11244.0 Loophole with EAM at 2103. (Perron-MD)
- 11256.0 Holloway-Ethiopian Airlines, Addis Ababa, Ethiopia, working various aircraft, at 1648. (Boender-Netherlands)
- 11339.0 Saudia Jeddah-Saudi Airlines, Saudi Arabia, working Saudia flight 3761, at 1712. (Boender-Netherlands)
- 11354.0 Falcon-Gulf Air, Manama, Baharain, working various aircraft, at 1712. (Boender-Netherlands)
- 11494.0 Shoulder-US military, one of many stations in almost continuous use of this frequency and 6757 for most of day, at 2224. (Haverlah-TX)
- 13200.0 Unid-Arabic speaking Egyptian calling Port Said, at 2043. (Perron-MD)
- 13211.0 Navy 50515-US Navy, working Andrews VIP, given new frequency of "F-365" (11059 kHz), at 1418. (Jones-CA)
- 13245.0 Ironweed- clear and secure voice checks with Nightwatch 01, US military airborne command post, at 1811. (Perron-MD)
- 13956.4 Tunis-Coded diplomatic traffic in fec, at 1517. (Bob Hall-RSA)
- 14581.0 Russian Navy, in undecodable teleprinting mode, at 1557. (Hall-RSA)
- 15016.0 SAM 203-US Air Force VIP flight, patch via Yokota to SAM Command, mentioned F-236 (15041 kHz), at 0640. (Jones-CA)
- 15041.0 SAM 203-US Air Force VIP flight, patch via Andrews to Midway, at 0650. (Jones-CA)
- 16207.0 Russian Navy, in undecodable teleprinting mode, at 1554. (Hall-RSA)
- 16207.0 Russian Navy, undecodable teleprinting scheme, at 1651. (Hall-RSA)
- 16328.2 Zaire Bank circuit, with ARQ financial traffic, probably either Kinshasa or Lumumbashi, stopped abruptly, at 1145. (Hall-RSA)
- 16422.0 RFFAB-Ministry of Defense, Paris, France, ARQ-E3 news in French to AIG 2012, 2013, and 2020, at 1110. (Hall-RSA)
- 16428.0 Polish Embassy, Nairobi, Kenya, Polish language messages to Warsaw, in POL-ARQ, at 1716. (Hall-RSA)
- 16631.7 DLKGMK-Egyptian Embassy, Luanda, Angola, with Arabic messages in ARQ, at 1541. (Hall-RSA)
- 16797.5 UYDV-Russian vessel *More Sodruvestna*, with RTTY traffic in Russian for URL, Sevastopol, at 1725. (Hall-RSA)
- 16803.0 Soviet ship *Alexandr Mironenko*, with RTTY to Murmansk Tralflot Kmd, Titov, at 0820. Ship Man of Prudential?-FEC maritime news from Manila, Phillipines, saying "God Bless us All," at 0912. (Hall-RSA)
- 16803.5 UHFL-Russian fishing vessel, reporting catch in RTTY, at 0920. (Hall-RSA)
- 16966.0 ZRQ-South African Navy, Silvermine, RSA, with CW marker at 0900. (Hall-RSA)
- 17440.0 Backwater 03-Aircraft, with patch via Skycom regarding maintenance status, at 0520. (Jones-CA)
- 17548.5 SOT265B-Warsaw Radio, Poland, with FEC marker, at 1756. (Hall-RSA)
- 18018.0 Architect-Royal Air Force command, with airfield status report at 2200. (Perron-MD)
- 18023.0 SAM 206-US Air Force VIP flight, enroute to Hickam, with patch through Andrews VIP to Alpha-81, at 0411. (Jones-CA)
- 18212.0 9XK79-Deutsche Welle, German overseas broadcast service, possibly Kigali, with extended RTTY radio technician's chatter in English and German, at 0844. (Hall-RSA)
- 18254.3 SUU-Cairo Meteorological, with weather codes in RTTY, bad keying, at 1736. (Hall-RSA)
- 18269.0 HBD20-MFA, Berne, Switzerland, with 5-letter code groups in ARQ, at 1739. (Hall-RSA)
- 18973.5 TAD- Ankara, with news in English and French, in FEC-A at 1524. (Hall-RSA)
- 19217.0 DFZG-MFA, Belgrade, Yugoslavia, with urgent, and heavily encrypted, RTTY bulletins to all stations at 1520. (Hall-RSA) *This was logged a couple of weeks before the bombing began.* -Hugh
- 19689.0 Russian Navy, in undecodable teleprinting mode, at 1554. (Hall-RSA)
- 19724.5 UIW-Kaliningrad Radio, Russia, with RTTY traffic for vessels *Dionis Bogdanov* and *Orlik*, at 1530. (Hall-RSA)
- 20890.0 Unid-US Customs encrypted speech, at 2048. (Perron-MD)
- 22459.0 XSX-Chilung Radio, Taiwan, China, with CW marker at 0822. (Hall-RSA)
- 22575.0 PKX-Jakarta Radio, Indonesia, with CW marker at 0825. (Hall-RSA)
- 22587.0 LPD71, Gen. Pacheco Radio, Argentina, with CW marker at 1625. (Hall-RSA)
- 22953.0 HBD20- Swiss MFA, Berne, Switzerland, 5-letter code groups in ARQ, at 1545. (Hall-RSA)
- 23461.0 Unid-Male voice with 5-figure numbers in British-accented English. This frequency is usually British intelligence, Guam, but that one [Cherry Ripe - Hugh] is always a female. Heard at 1140. (Hall-RSA)
- 24369.9 RFGW-French MFA, Paris, with 5-letter code groups in FEC to W9L, W3S, and G7M, at 1513. (Hall-RSA)
- 25910.0 WJFP-Ft. Pierce, FL, program feed from commercial FM station to traffic reporters in the field, callsign W230AL heard too, at 2100. (Benjamin Loveless-US)



Old Systems, Still Going Strong

This month we'll take a look at two countries still very active across the shortwave bands with some very modest, old equipment serving their diplomatic communities — Cuba and Egypt. Both should provide a gentle introduction into diplomatic communications with just about any digital decoding equipment.

You need none of the fancy decoding equipment mentioned last month, and any amateur decoder that can handle standard RTTY and SITOR will work great. Another point in your favor for catching Cuban or Egyptian diplomatic communications is that they have a loud and strong signal, especially if you are on the East Coast of the U.S.

■ MFA Havana, Cuba

For a number of decades, the Cuban diplomatic service (Cuban Ministerio de las Relaciones Exteriores or MINREX) has continued to communicate with its embassies overseas and provide daily news broadcasts using plain and simple Baudot RTTY. Most commonly, RTTY with a speed of 75 baud and a shift of 500 Hz is used, although a few monitors have recently spotted the use of standard amateur Packet Radio on links between Havana and Managua.

Embassies have also used CW, RTTY at 100/500 and RTTY at 50/1000. There are two tell-tale signs of Cuban activity. The first is that news broadcasts, usually in Span-

ish, are signed "prensa minirex." Secondly, embassy messages, usually sent as encrypted five number groups, are signed "embacuba" followed by the location of the embassy by either the city or the country. For example, "embacuba kinshasa" or "embacuba conakry."

Table 1 gives a list of call signs and locations for the most commonly heard embassies (at least from our East Coast location). With stations around the world in most developing countries there should be a signal to catch in your location no matter where you are located.

Following is a list of the most commonly logged frequencies for Havana and its embassies. Check a few kilohertz either side of the published channel since communications often move around according to the preferences of the individual operators.

15965 16134 16334 16351 16355 17432
18012 18032 18049 18056 18421 18449
18458 18467 18477 18647 18657 18667
18677 19160 19517 20032 20813 20825
20837 20847 20857 22865 23044

■ MFA Cairo, Egypt

Like Havana, Cairo has long been using the same HF system, in this case standard SITOR-A ARQ, but they have also used SITOR-B and TWINPLEX. This fact, coupled with their use of just about any frequency (as long as it has a 0.7 kHz offset, and sometimes including those inside the

protected amateur bands), makes this organization a relatively simple catch for the new listener.

The MFA's SITOR transmitters also use a constant carrier between each SITOR burst, another fact which makes the Egyptians easy to spot. As ever, with SITOR-based systems, selcals (selective calls) also provide clues.

MFA Cairo: SSBE, SSBT, SSBV, SSTA, SSTA, SSTR, SSTA
Embassies: KKxx, TVxx, RCxx, OOxx, QQxx

Although monitors are often intimidated by the fact that the Egyptians use the ATU-80 Arabic teleprinter alphabet for most of their messages, it is possible to perform letter-by-letter substitution followed by a bit of guesswork to reveal the locations of message recipients. A point to remember is that numerics are written right to left and times are local. Klingensuss's *Radio Data Code Manual* gives details on how to perform this decoding. Here are some useful keywords often seen in ATU-80 messages:

bkfqs	MFA Cairo
faj	number (of telegram)
huxd	please
jg	from
kdakfr	MFA Cairo
kds	to
yfasr	telegram
yks yks	bye bye (often used to end messages)
yphkg	embassy

Unfortunately, a complete frequency list for MFA Cairo would occupy this whole column, so instead, here are some frequencies logged in the US over the past year:

10126.7 11023.7 11026.7 11034.7 11056.7
13336.7 14456.7 14501.7 14621.7 15006.7
15801.7 16071.7 16318.7 17961.7 18051.7
18211.7 18316.7 18751.7 19046.7 20081.7

So dust off that simple decoder, there's diplomatic action to be heard!

For one of the most complete references on diplomatic communications refer to the WUN (<http://www.gem.net/~berri/wun/>) Diplo Corner Collection last updated 6/16/98. This collection was compiled from Ary Boender's "Digital Review" column by Dave Wright and is a great reference with frequencies, examples and signal details covering countries around the world.

Table 1: Cuban Embassy Traffic

Callsign	Location	Signature
CLP1	MFA Havana	"minirex"
CLP4	Bissau	"embacuba bissau"
CLP7	Brazzaville	"embacuba r d congo"
CLP8	Conakry	"embacuba conakry"
CLP18	Dar es Salaam	"embacuba tanzania"
CLP23	Lagos	"embacuba nigeria"
CLP44	Harare	"embacuba zimbabwe"
CLP65	Managua	Unknown
CLP67	Baghdad	"embacuba iraq"
CLP75	Accra	Unknown
CLP??	Kinshasa	embacuba kinshasa"

Other less common signs include:

CLP2 - Panama, CLP3 - Moscow, CLP5 - Alger, CLP6 - Damascus, CLP7 - Brazzaville, CLP9 - Sanaa, CLP12 - Lima, CLP13 - New York, CLP15 - Beirut, CLP16 - Sao Tome, CLP17 - New Delhi, CLP21 - Phnom Penh, CLP22 - Hanoi, CLP24 - Cotonou, CLP25 - Maputo, CLP27 - Pyongyang, CLP28 - Lusaka, CLP33 - Addis Ababa, CLP38 - Paramaribo, CLP45 - Luanda, CLP55 - Georgetown.

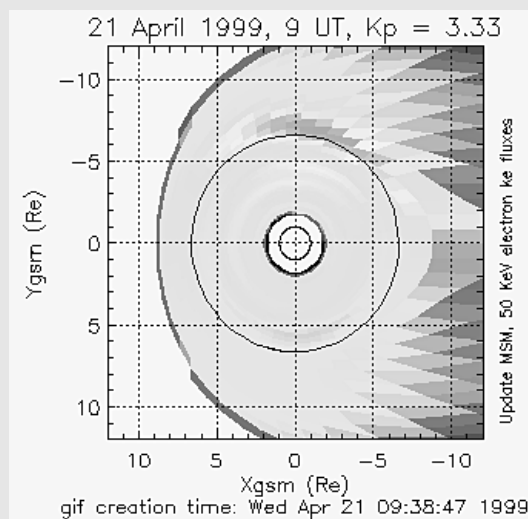
Glenn Hauser, P.O. Box 1684-MT, Enid, OK 73702
E-mail: <ghauser@hotmail.com>; fax: (580) 233-2948, ATT: Hauser

Find It on the Web

A huge zipped file in frequency order covers most, but not all international shortwave broadcasting schedules for the current season. The public version of the A99 internationally coordinated SW (HFCC) schedule is at <http://itre.ncsu.edu/radio/hfcc/a99allx2.zip> says Dan Ferguson.

The International Broadcasting Bureau (IBB) Monitoring site run by Bill Whitacre, which is freely accessible to everyone, has changed its domain to <http://monitor.ibb.gov> reports Danish SW Club Intl's *DX Window Caught in the Web*

The Space Environment Center (SEC) has released another "routine test product." The Rapid Prototyping Center (RPC) will make available on its website short-term predictions of geomagnetic activity. SEC will run this test model every 15 minutes, to generate a prediction of the next index; prediction lead-times will be 30 to 90 minutes, depending on the conditions in the solar wind. The test product can be accessed through <http://sec.noaa.gov/rpc/index.html> says *SEC User Notes*. (The circle at 6.6 represents location of geosynchronous satellites)



ANTARCTICA LRA 36, 15476, ran a special test for USA [not Canada] on a Saturday evening in late March, 2330-0100; and might broadcast weekly at this time (Gabriel Ivan Barrera, *Cumbre DX*) Widely reported during below-normal propagation, but not heard subsequently (gh)

BANGLADESH Radio Bangladesh's domestic services are transmitted from the Savar site which consists of a 100 kW Continental — is 1960s vintage tube, takes almost 2 hours to warm up on a dummy load, rarely radiates more than 50 kW and wavers by almost +/- 50 kHz from the nominal. It functions like an oven — the hotter the tubes, more stable the carrier and less wavering! The other transmitters are Russian of indeterminate power as they can work from 30 to 100 kW depending upon the settings which no one is sure what they are, given the Russian manual and lack of support. They are hardly ever run due to lack of spares — parts are cannibalized from other transmitters of the same type. Compared to Savar, the other HF site at Kabirpur with their twin 250 kW Thomsons appear as spank and high tech.

English external services: 1230-1300 GOS, 1745-1815 Voice of Islam, 1815-1900 GOS on 250 kW Kabirpur 7185 and 9550; the last two also on 15520 100 kW Savar (Manosij Guha, India, *Cumbre DX*)

BELGIUM [non] The first three nights of RVI's new relay via Bonaire to WNA on 0400 on 15565 were totally inaudible (Larry Nebron, San Francisco, *Review of International Broadcasting*) Not too good here, but audible; has adjacent interference from RN Dutch on 15560. At first indecisive about whether to run repeat or prepeat of 2230 on same, seemed to settle on repeat, so *Radio World* appears on UT Monday (gh)

BURMA [non] Democratic Voice of Burma, via Juelich heard on new 17750 in Burmese to 1330*, but mixing with WYFR. Much better when it came back at *1430-1455*, // 5945, 11850 and NF 15600 (Matt Francis, ACT, *Electronic DX Press*)

CANADA The now daily RCI 0500-0530 on 5995, 9755, 11930 to WNA, et al to elsewhere contains *First Edition* M-F; *Earthwatch* on Sat; *Arts in Canada* on Sun (via Bill Westenhaber)

CENTRAL AFRICAN REPUBLIC David Smith of Radio MINURCA updates us on what is going on with the new transmitter they were supposed to have on the air by the end of March: "We haven't purchased it yet. These things inevitably take more time than expected in the UN. We will succeed eventually! A proposal has been put forward, and I await approval.

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; A-99=summer season, Mar-Oct; [non] = Broadcast to or for the listed country, but not necessarily originating there.*

We're still using the 123 watt shortwave transmitter for service within the CAR" (Hans Johnson, *Cumbre DX*)

CHILE Voz Christiana A-99 Schedule per Andrew Flynn, station engineer, who adds that "I have increased our transmission time from Chile so that our four transmitters to Latin America are on around the clock. Spanish: 6070 kHz at 2000-1200 UTC, 9635 at 1200-2000, 11690 at 0100-1300, 11745 at 2100-1100, 15375 at 0000-1400, 17680 at 1400-2400, 21500 at 1100-2100, 21550 at 1300-0100. (*Cumbre DX*)

COLOMBIA FARC clandestine La Voz de la Resistencia del Bloque Oriental presumed on 6168.3, bits of music and talk audible around 1145 March 16, but fading into daylight; a bigger problem is the mixing product of R. Martí on 6170, from the two superpower signals on 5890 and 6030, 140 kHz apart, which lasts until 1200* (gh)

As far as I can tell, their name is still Voz de la Resistencia, i.e. without a "La" and without "del Bloque Oriental" as Jorge García will have it. The commander mentioned as "Guillardo" is actually "Gildardo" and the three Americans have not been mentioned as "missionaries" — at least not in the religious sense of the word — but rather as friends of the uwa Indians.

Most of the inter-guerilla communications are on USB in the 6 and 7 MHz bands, so "7735 VHF" could also be interpreted as "7735 USB", who knows. I have a tape with some unusual stuff on it, such as a Red Cross official and a European Ambassador negotiating the release of kidnap victims with the guerilla...

When in Colombia, I often checked 6694U, which is one used by the CICR on a nationwide basis, between Bogotá and a network of half a dozen fixed stations in other areas and also mobile transmitters mounted in 4WDs which move around in areas of turmoil (Henrik Klemetz, Sweden)

Radio Auténtica, 5975, Villavicencio, at 1130-1210, new station, ex Radio Macarena. Now belongs to Cadena Radial Auténtica de Colombia, an evangelic organization of Centro Misionero Bethesda (Rafael Rodríguez R., Bogotá)

CONGO REPUBLIC Radio Bunia heard many times on 6828 around 1800 until off at 1900 in French with news, debate, songs; then running an hour later to 2003* Also on 5066 at 1540-1615* (Mahendra Vaghjee, Mauritius)

COSTA RICA RFPI's new website is now up: <http://www.rfpi.org> (John H. Carver Jr., IN) And E-mail changed to info@rfpi.org (gh) There are

plans to replace the totally inadequate 1948-vintage power line serving RFPI this year with a whole new system, which will then be extended as far as Jaco Beach area (RFPI Mailbag)

CUBA [non] The USIA's Office of Cuba Broadcasting has made a major update to its web page <http://www.ibb.gov/marti/> All pages are in Spanish. The site has uploaded audio clips of its news and cultural programming, and a picture gallery of administrators and employees (A. F. Mastrapa, *Clandestine Radio Watch*)

FRANCE RFI uses 25820 in French 0900-1255 UT. They are still the only (audible) station using the top band. (Andre Schmidt, Lautert, Germany, *Electronic DX Press*)

GERMANY The A99 Deutsche Welle engineering schedule is now available on the ADDX web site at http://www.addx.de/px_dw.htm Here's the A99 English schedule for N. America.

0100-0145: 6040 Antigua, 6145 and 9640 Wertachtal, 11810 Sackville, and 13720 Sines.

0300-0345: 6145 Wertachtal, 9535 and 11810 Sackville, 9640 Antigua, 13780 Sines and 15105 Bonaire.

0500-0545: 9615 Wertachtal, 9670 Antigua, 11795 Bonaire and 11810 Sines (Jim Moats, OH, *Review of International Broadcasting*)

DW English to Europe greatly expanded to 0600-1329 and 1600-1900 on 6140, 100 kW, 305° (Andreas Volk, Germany) This is part of the expanded DW English service to 24 hours on satellite and internet (DW press release)

GUAM *Pacific DX Report* is now scheduled on KTW: Fri (first release) 1030-1045 to NEAs 9865; Mon 1545-1600 to SAs 15330; Tue 0900-0915 to SEAs 15200; Thu 0800-0815 to SPac 15330 (Bob Padula, *Electronic DX Press*)

HONDURAS 5890 - HRMI - Hans Johnson hadn't been able to hear a thing here in Florida despite numerous tries, so he spoke with Pastor James Planck at IMF World Missions in California:

HRMI has been off since last summer. We hope to have it back on in a few weeks and I'll be traveling to Honduras to do so. The problem has been lack of a trained technician so we'll be doing some training while we're there. Once it is back on, we'll be running 3 kW into a folded dipole. Our schedule will be 6 a.m. till 11 p.m. or 12 a.m. (1200-0500/0600). We'll also be expanding this facility by adding two 10 kW transmitters. One will operate in the 31 meter band and target Cuba and the other in the 25 meter band for Africa (Hans Johnson, *Cumbre DX*)

HUNGARY Radio Budapest's new English schedule is up on their web site and is as follows: North America: 0100-0130 UT on 9560 kHz, 0230-0300 on 9840; Europe: 1900-1930 on 6025 7170; 2100-2130 on 6025; 2130-2200 on 3975. There is no mention of the 25700 channel on the schedule for Hungarian (Mike Barraclough, England)

INTERNATIONAL VACUUM *World of Radio* on World Radio Network, in UT: WRN1 to North America: Sat 1600, Sun 0530; WRN1 to Europe: Sat 0330, Sat 0800; WRN1 to Africa/Asia/Pacific: Sun 1030 (gh)

IRAN Voice of the Islamic Republic of Iran new observed schedule, English portion. N = new frequency

0030-0130 9022 N9795 N11970

1100-1230 N13710 15255 N15430 N17565 N21510

1530-1630 7250 N11680 13605 N15150

1930-2030 7215 9022 (also N9880 - it was unheard, only as tentative)

2130-2230 English N11740 N13745

(Mikhail Timofeyev, Russia)

[non] New info on WWCR Persian (Farsi) Radio International Program on 15685 at 1300: it's a pro-communist program. Seems to me they are connected to the Iranian Communist Labor Party (It is outlawed in Iran). They have mentioned their fax number for contacts: 416-515-6722 (anon.)

IRAQ I heard Radio Iraq International at 2117-2128* on 9685, ID as "This is Baghdad"; very poor audio, sounded like they were running on low voltage (Jonathan Kempster, England) "Clandestine" Mother of Battles Radio, 9714.6 at 1700 announcing 693; 11785 and 9685 to Europe; 9715 to Syria, Lebanon and North Africa (Mahmud Fathi, Egypt, *Cumbre DX*)

KOREA SOUTH [non] RKL *Multiwave Feedback* announced that Spanish via Canada was expanding to a full hour at 1000, pushing English later from 1030 to 1100-1130 and on 9650 instead of 11715. However, this did not immediately happen and English showed at 1030-1100 on 11715 in April (gh)

LIBYA Keep an ear on Libya's frequencies of 11815 and 15435 if you like African music. They are playing a fair amount as part of their Voice of Africa effort. Heard a real good Chadian music program the other day. Best times are 2000-0300 (Hans Johnson, FL, via Richard Cuff, swl@qth.net)

LITHUANIA Sporadic tests (with test tone) can now be heard on 9710 from the new 100 kW transmitter in Sitkunai near Kaunas. The new equipment which also includes an improved antenna (beam: 259°) is to be officially inaugurated in April (Bernd Trutenau, Lithuania, *DSWCI DX Window*) Improved audio on 9710, including English at 0930 (Kai Ludwig, Germany) They plan to use it instead of Juelich, Germany, for English to NAm at 0030-0100 on 9855 (Kai Ludwig, and Alan Holder, Isle of Wight)

MEXICO XETF, "La Jarocha," Veracruz, plans to reactivate SW 9545, duplicating



MW 1250 but possibly with some special SW programming (César Fernández De Lara García/Rafael Gustavo Grajeda Rosado, Sociedad De Ingenieros Radioescuchas via Pedro Sedano, *Noticias DX*)

MONGOLIA VOM has moved from 12085 to 12015 for English; heard April 13 at 1130 in Standard Chinese on 12015; and 1200 opening English with new schedule: Au 1200 UT on 12015; SAs 1500 UT on 9720, 12015; Eu 1900 UT on 9720, 12015 (gh)

Radio Free Asia via Ulan Bator, A99, 250 kW: 5855 kHz at 1530-1630; 7460 kHz at 2200-2300; 7470 kHz at 1500-1600, 2300-0000; 11580 kHz at 2330-0030; 15205 kHz at 0000-0100; 17730 kHz at 0100-0200 (Bob Padula, *Electronic DX Press*)

NEW ZEALAND RNZI on 9700 has been extended to 1109* (Finbarr O'Driscoll, Ireland, *Review of International Broadcasting*) Additional time for fortnightly Mailbox is UT Thu 0305 on 17675 (Mickey Delmage, Alta.)

NIGERIA [non] RFPI's new Nigerian program heard Fri March 26 1231-1328 on 21460-USB (having missed the presumed original airing Thu at 2030 and first repeat Fri 0430). As I suspected, it was not in Swahili, but mostly in Yoruba, as announced in brief English portions. Talk segment in Yoruba mentioned "Revolutionary United Front" at 1246 — so is there a clandestine element to this show? English IDs were "ABS Radio International" sometimes adding, as at 1248 "...the Voice of Democracy." At 1259 gave P- and E-mail addresses during Yoruba, one ending in .net, but I missed them. Wrapup in English at 1325 mentioned "Fleet Commander," perhaps the title of the seaker or the sponsor of the program. The following week sounded evangelical about Jesus Christ, but perhaps just inspired by Easter; and no-show the week after that (gh)

NORWAY For about three weeks in March, one of the two R. Norway (and Denmark) transmitter sites, Kvitsoy, was off the air since first one, and then the other undersea cables supplying power to the island, broke. This prevented broadcasting to the western hemisphere, while the other site, Sveio continued to the eastern (gh)

PERÚ Radio Panorama, 5906.8: I was happy to receive a letter signed by Segundo Ayala Brione, owner of Radio Panorama, in which he confirms my reception report from past January. He says that he and his brother Miguel have set up La Voz de los Andes, 1400, mediumwave, and Radio Panorama, 5900. They belong to an evangelical church and that's the reason why they broadcast their Global 2000 morning program which, apart from prayers, consists of religious music. The MW outlet carries commercials and so it is the economical backbone of the SW operation which does not carry any commercials. Schedule, somewhat irregular, is 1000-1200, 2300-0200.

As for Recopampa, he tells me that it is a "centro-poblado" belonging to the jurisdiction of Sorochuco, having approx. 700 inhabitants. Its full name is San Juan de Recopampa. One may write them at Radio Panorama, Centro-poblado Recopampa, Distrito de Sorochuco, Provincia de Celendin, Departamento de Cajamarca, Región Autónoma del Marañón. There is also a phone number, which can be used, + 51 (44) 820 321, although this is to a public phone booth. Thanks to Henrik Klemetz for correct translation. (Rafael Rodríguez R., Bogotá, Colombia)

R. San Miguel de El Faique on new 6987.1 ex-6895.2, 2245-2330 with folk music, ads, ID (Rodríguez) Also to 0253* with huaynos and chicha music (Nicolás Eramo, Argentina, *The Four Winds*)

We also are in the planning stages of a tropical band and international band station in Iquitos. We have an engineer on site and we're confident that we'll get frequencies (James Planck, IMF World Missions, see Honduras, via Hans Johnson, *Cumbre DX*)

PHILIPPINES We also have plans for a station in Batangas, using the tropical bands, 31, and 19 meter bands from a site overlooking the South China Sea. The tropical band for the Philippines and the international bands for China and Vietnam. We use our station(s) as part of our church-planting mission around the world (James Planck, as above)

RUSSIA I was informed by Mikhail Timofeyev, that from April 2nd Voice of Russia expanded its special broadcasts about the Kosovo war. The complete schedule is on <http://www.vor.ru/kosovo/> where they also in detail deal with the topic:

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THE VOICE OF RUSSIA

1900 English, 1920 Russian, 1940 German, 2000 French, 2020 Serbo-Croatian, 2040-2100 Albanian on 1548, 7350, 11980 and 12000; 2100-2230 Serbo-Croatian on 1548, 7350 and 12000; 0300-0430 Serbo-Croatian on 1548, 7440 and 9485, 9485 and 12000 with 200 kW towards 215 degrees from the Popovka site near St. Petersburg.

The 20-minute language blocks are separated by a hand-over to the colleagues from the following language staff and a gong. It is rather remarkable, that they also speak straight to the NATO troops, including an affirmation, that "our broadcast company will continue to give you informations, which you don't get from your superiors" (Kai Ludwig, Germany)

Part of their appeal to servicemen on the site reads: "Neither the NATO leaders nor President Clinton are likely to be worried if this Easter happens to be the last in your lives. They don't care if your missiles and bombs turn Easter into a nightmare and spell death for men, women and children of Yugoslavia. Use your brains" (Mike Barraclough, England)

SPAIN On REE Radio Waves Justin Coe gave new English schedule at last minute: 0000 and 0100 to NAm/Au/Pacific Rim [really?] new 15385 at 0500 to same, still on 6055at 2000 M-F Europe, new 15285 ex-9680, and Af still 9595 at 2105 Sat and 2100 Sunday Europe on 15105, Africa 9595

Also announced an E-mail address for the English service new to me, which, since it is based on Spanish, they had to spell out: lenguas_extranjeras.rne@rtve.es

The wacky situation again this summer for the Eu/Af broadcasts with not only different times but different frequencies depending on day of week I think is due to the exigencies of the much higher priority Spanish programming, perhaps due to weekend ballgames.

Joe Hanlon and I agree that REE overdid the MUF prediction for this transmission, tho 15385 may well make it a good portion of the summer, especially further east. 11 MHz band, or 13 at the most, would have been preferable (gh)

SRI LANKA Visited the new VOA site at Iranawila, about 100 km from Colombo. Beautiful site with 26 curtains. Marconi is expected to hand over the transmitters to VOA in late June or early July. Then testing will begin; and regular broadcasting by late September or early October (G. Victor A. Goonetilleke, Sri Lanka, RN Media Network)

SWEDEN After 39 years at Radio Sweden, Al Simon is retiring. Best known in recent years as a reporter, newsman, and the host of our business and labor magazine *Money Matters*, over the years Al has interviewed kings and queens, presidents and prime ministers, top politicians and business leaders. But Al showed another side as our food expert, presenting a wide variety of Swedish dishes for our listeners in *Thought for Food*. We'll miss Al, but fortunately we've managed to talk him into returning from time to time. Stay tuned! (Radio Sweden, via Larry Nebron)

SWITZERLAND SRI website is now operative under the URL <http://www.swissinfo.org> and <http://www.sri.ch> will also work. The idea of the new site is that it is not just SRI, but rather the place to go for any and all information about Switzerland. It is full of Swiss-related links, and it also features audio files which include the latest news and current affairs program, as well as features like *Capital Letters*, *The Name Game* and *Rendezvous Tourism* (Bob Zanotti, SRI, *Review of International Broadcasting*)

TAHITI RFO 15170 R.I.P. - I interviewed Leon Sequin of RFO's technical section and the news is not good. Here is what he had to say: We have cancelled the shortwave. RFO HQ told us to turn it off several weeks ago. Our transmitter is very old and the country now has an FM network. There was no reason to keep it on.

(When Tahiti returned to the air a few years ago, there was speculation that they had gotten a new transmitter or perhaps the one from RFO New Caledonia. I asked Leon about this) These were our old transmitters from 1970, that's all we used. (I asked him if there was any chance of them coming back on shortwave.) He replied, that doesn't seem to be the way of history (Hans Johnson, *Cumbre DX* Copyright)

This led to a number of attempts to log RFO 15170; some listeners were convinced they heard RFO on at least one occasion following this report; many others noted WYFR on the same frequency in French at certain hours (gh)

TONGA I interviewed Radio Tonga's Chief Engineer Maka Tohi by telephone recently. Here is what he had to say about Tonga on shortwave:

We were not able to get a transmitter from UNESCO and this project isn't going anywhere. As far as our existing transmitter, it remains broken. I simply do not have time to repair it and it is not a priority. We are short of staff here and are too busy.

We got shortwave to be a backup to our AM, which were old at the time, or if we lost power at the transmitter site after a cyclone. The shortwave was small enough to re-install at the studio and run it from there. But the shortwave never worked well with salt corrosion on the antenna causing faults in the

transmitter. We now have newer AM transmitters and a new generator at the transmitter site. The shortwave is a redundancy that never had much of an audience anyway (Hans Johnson, *Cumbre DX* Copyright)

UKOGBANI Throw away your expensive *BBC On Air* — BBC WS kept juggling its programs contrary to plans just to accommodate more news. One of many examples: on Sundays, supposed to have 1515 *Concert Hall*, 1830 *Play of the Week*, 1930 *World of Music*. But to avoid *Play* running through the top of an hour instead of news, they actually ran: 1501 *Play*, 1830 *World of Music*, 1915 *Concert Hall*. So we had one minute of news at 1500 and 15 minutes at 1900, and total confusion about when to hear other programs (gh)

USA On *Al Weiner Worldwide* WBCQ's manager said the transmitter is a Harris PDM, the only one known to have been converted from MW to SW. A second studio is now being built, with a 16-channel Siemens board which was originally used by ABC-TV for the 1976 Olympics. This studio will have a computer to help store music, IDs, etc., but WBCQ will never be automated. Plan to start wiring in the second transmitter in May.

Not only is WRMI, 9955, Miami, obliterated by Cuban jamming when trying to hear it in North America, but also the same situation noted during a Caribbean cruise circumnavigating Cuba. What a waste (Volodya Salmani, BC, *Cumbre DX*)

Voice of America news: Mark Nathanson, chairman of the U.S. Broadcasting Board of Governors, told a VOA staff meeting that Evelyn Lieberman, director of VOA and its parent body, the International Broadcasting Bureau, will leave VOA. She will be nominated for a senior State Department position, undersecretary of state for public information. Mr. Nathanson also announced that Sanford Ungar, now dean of the School of Communication at American University here in Washington, will become VOA's new director. Mr. Ungar was formerly a journalist at National Public Radio.

Judy Massa has been able to obtain an expansion for her VOA *Border*

Crossings music request program, Monday through Friday following the news at 1700-1800 to East Asia, 5955 and 11885 via the Philippines. And to the Middle East and South Asia, 9535 via Lampertheim, Germany, and 12025 and 15160 via Kavala, Greece. She will be competing with another VOA English-language program, *Talk to America*, at the same time to the same targets Judy Massa has her own Web site which, like the CW site, is not mentioned at or linked to the VOA Web site, <http://www.judymassa.com> A new VOA News Now segment, *Women in Business* runs 2.5 minutes, Monday, Wednesday, and Friday, during the business feature at about 50 minutes past each even UT hour (VOA *Communications World* via John Norfolk)



World of Radio summer schedule: On WBCQ, 7415, Wed 2100. On WWCR: Sat 1130 12160, UT Sun 0229, 0630 on 5070; Mon 0500 3210; Tue 1230, 2030 on 15685. For the latest updates see <http://www.angelfire.com/ok/worldofradio> (gh)

VANUATU Radio Vanuatu's technician Willie Daniel was kind enough to tell me what has been happening on shortwave at his station:

Two of our three 10 kW transmitters are off the air. We are trying to get spare parts, but this is difficult and takes a long time. Our service is for the outlying islands on the following schedule: 4960 1730-1015 running 10 kW. The below are off the air for the moment but will run on the following schedule when they return - 3945 1730-2130 and 0515-1015, 7260 2130-0530 (Hans Johnson, *Cumbre DX* Copyright)

VIETNAM Voice of Vietnam has again changed its freq schedule. All programs via 100 kW Hanoi-based transmitters are two new freqs (observed period is between 1000 and 0100 only): 9730 and 13740 (both with some drifts in the range of 1-3 kHz) at 1100-1130, 1300-1400, 1600-2130 and 0000-0100. Other time tentatively on 9840 and 12020 (all languages as in *WRTVH*). (Mikhail Timofeyev, Russia)

New frequencies for VoV broadcasts direct from Hanoi: 13740 and 9730 replacing 12020 and 9840. Heard in English for Europe 1800, 1900 and 2030 UT. Good signals on 13740 but severe heterodyne on 9730 (Alan Holder, Isle of Wight)

YUGOSLAVIA All ears were on R. Yugoslavia as hostilities began, but two seasonal schedule changes within one week made this a challenge to keep up with. During April, English scheduled: 1900-1930 UT to Au on 7230 kHz; 1830-1900 to Af on 9720; 1830-1900 to Eu on 6100; 2100-2130 to Eu 6100, 6185; 0000-0030 to ENam on 9580 exc Sun; 0430-0500 to WNam on 9580 kHz.

The programs themselves had little specific war news, but half an hour of cold-war-style anti-NATO rhetoric delivered in a monotone, such as: "...neo-Nazi policy of the United States and its satellites"; "...criminal NATO aggression against sovereign Yugoslavia." If you don't still find them on 9580, check the 25 meter band such as 11870, where they were last summer (gh)

Until the Next, Best of DX and 73 de Glenn!

Gayle Van Horn

0005 UTC on 4895

BRAZIL: Radio Bare. Religious programming *A Voz de Libertacao, de Igreja Pentecostal* with evangelical music to station ID as "Radio Bare, Manaus." Daniele Canonica, Switzerland/*Hard Core DX* Brazil's **Radio Educacao Rural** noted on 5035.09 at 0929 with morning cock crows, cute homemade jingle into primitive accordion/drum music of fair quality. (Al Quaglieri, Albany, NY)

0059 UTC on 6010

ITALY: RAI. English service on Italian lawyers arriving in Turkey to defend terrorist on trial. (Bob Fraser, Cohasset, MA; Frank Hillton, Charleston, SC)

0100 UTC on 9580

SERBIA: Radio Yugoslavia. English service with target area quote. News and opinions on NATO bombings ("NATO criminals" and "atrocities by terrorists"). Email read from American listeners to music at 0130. (Larry Fowler, Albany, NY)

0200 UTC on 9570

ROMANIA: Radio Romania Intl. English to North America to 0300, fair to good quality, // 6155, 9510 non audible. Monitored 0400-0500, 5990 good. (Lee Silvi, Mentor, OH)

0200 UTC on 6000

CUBA: Radio Havana. News report to Cuban music. (Charles Jenkins, Charleston, WV) Cuba's **Radio Rebelde** noted on 5025 with IDs, brief text and *Bette Davis Eyes* pop tune from the 80's. (Harold Frodge, Midland, MI)

0300 UTC on 7250

RUSSIA: Voice of. Very weak signal for newscast and audio book segment. (Jenkins, WV) *Moscow Mailbag* on 7180, 5940 at 0310. (Jim Boynton, Newton, MA)

0300 UTC on 9475

EGYPT: Radio Cairo. News text with ten minutes of fair audio quality. (Jenkins, WV) Distorted audio with English Islamic teachings to 2344 to *Modern Arabic Culture* program. (Jenkins, WV)

0320 UTC on 9690

SPAIN: China Radio Intl relay. Regional news including China's crackdown on overseas smuggling. (Jenkins, WV) **CRI** noted on 11675 at 1300. (Boynton, MA)

0330 UTC on 13675

UNITED ARAB EMIRATES: UAE Radio-Dubai. International news, local weather and program on Arab history. (Jenkins, WV)

0335 UTC on 9485

BULGARIA: Radio Bulgaria. *Answering Your Letters* program of good quality. Sunday's *Folk Studio* noted on 7535 at 2010. (Boynton, MA)

0410 UTC on 9885

SWITZERLAND: Swiss Radio Intl. Report on the 15th *International Country Music Festival*, with excellent reception. (Boynton, MA)

0500 UTC on 7255

NIGERIA: Voice of. Upbeat African music to partial speeches between music segments. (Jenkins, WV) **VON** also audible 15120, 1951-2001+ with *World Economic Report* into ID. Announcer in a "squeaky" chair gave program schedule. (Frodge, MI)

0604 UTC on 15170

TAHITI: RFO. Local programming of classical music and French chansons. Announcements and mentions of Tahiti, weak to fair signal, signal faded by 0645. (Enzio Gehrig, Denia, Spain/HCDX)

0615 UTC on 7230

JAPAN: NHK/Radio Japan via UK relay. *Asian Top News* program with fair to good quality. (Boynton, MA) Canadian relay noted on 11705 at 0023. (Jenkins, WV)

0700 UTC on 6990

USA: HAARP/Alaska. Special test broadcast from the "High Frequency Active Auroral Research Facility" in Gakoma, Alaska. Test consisted of Morse code, 6990 from 0700-0716, 3390 from 0719-0728. Fair to good signal with slight fading. Alaska's **KNLS** noted on 9615, 1300-1358 in English to east Asia. (Silvi, OH; Jenkins, WV)

0905 UTC on 21505

TINIAN/MARIANAS ISLANDS: IBB (Intl Broadcasting Bureau). English. Continuous music including country-rock, banjo, blues and pop "oldies." Taped ID at 0943 as a "test transmission." Music to ID repeat at 0959. Good-excellent signal. (Ralph Famularo, Japan/Cumbre DX; Silvi, OH)

0925 UTC on 9580

AUSTRALIA: Radio Australia. Report on security "bouncers" in Australia. *Sports Report* and *Music Deli*, of fair signal quality. (Boynton, MA) *Country Club* show with two hours of country & western music, 9580 at 1205. (Fraser, MA) PNG English//Tok Pisin service on 9710 at 0920-1000. Very good signal, // 12080, 5995, 6020. (Silvi, OH)

0917 UTC on 4939.47

VENEZUELA: Radio Amazonas. Spanish text of morning announcements to local time check. "Canned" station promo, audio oddly clipped but intelligible. (Quaglieri, NY)

0932 UTC on 4800.7

MEXICO: XERTA. Multilingual. ID at tune-in with multiple phone numbers into English station promo, to French and Russian ID and local time check. (Quaglieri, NY) Radio Mexico Intl on 9705, 0420 with weak ID and address.; (Jenkins, WV) 4800.7, 1223-1230 with "RMI" ID. (Frodge, MI)

1242 UTC on 12085

MONGOLIA: Voice of Mongolia. English feature on soldier's wives and families to tune, *The Soldier's Wife*, signal off abruptly in mid song. (Frodge, MI)

1410 UTC on 17560

GABON: Radio France Intl. Report on Bahrain with poor to fair copy. (Fraser, MA)

1730 UTC on 9617.50

MOZAMBIQUE: Radio Mozambique. (Tentative) Regional music, announcer in Portuguese, // 3210 with undermodulated signal to 1751*. Station noted on 6110.80 after 1751* on 9617.50, announcer's mentions Mozambique at 1758 and clear // 3210, block by Albania's **Radio Tirana** 1759 on 6119. (Karl can vooy, Netherlands, HCDX) - *Nice log, Karl!*

1738 UTC on 15244.50

CONGO (Dem. Rep.) (Tentative) Radio Nacional Congolaise. French service by male's African accented text. Weaker quality, no ID noted, recheck at 1800 with Afro pop music. (Van rooy, NLD/HCDX)

1930 UTC on 15180

PHILIPPINES: VOA relay. English broadcast of fair-good quality. *WRTH* listed as 50 kW transmitter. (Silvi, OH)

2150 UTC on 5047

TOGO: Radio Lome. French. Afro music to 2200 ID and mentions of Lome at 2211 into commentary text. Audible 2233-2245+ with American folk tunes, gospel, and country and western variety. (Frodge, MI)

2230 UTC on 13670

BELGIUM: Radio Vlaanderen Intl. News and feature about Dutch dictionary being on CD-ROM. (Jenkins, WV)

2230 UTC on 13730

AUSTRIA: Radio Austria Intl. News to *Report From Austria* on deadly avalanches of last winter. (Boynton, MA)

2257 UTC on 4955

COLOMBIA: Radio Diffusora Nacional de Colombia. Spanish IDs, "emissora nacional de Colombia," low signal with high static level. (Canonica, Switzerland/HCDX)

2305 UTC on 4950.1

PERU: Radio Madre de Dios. Spanish children songs ("Cumpleaños perte"), religious program and christian songs from 2330. Catholic mass from Santa Cruz cathedral, fair quality. (Michael Schnitzer, Haasfurt, Germany/HCDX)

2305 UTC on 15050

COSTA RICA: Radio for Peace Intl. Glenn Hauser's *World of Radio*. (Boynton, MA; Jenkins, WV)

2330 UTC on 15476

ANTARTICA: LRA-36-Radio Nacional Arcangel. Female's Spanish text to English for eight minutes into music program. (Silvi, OH) Fair signal, using USB to improve quality on 15475. Argentine music to 0102 announcement that "this has been a transmission for the United States." (Walter Salmaniwi, Victoria, BC Canada/HCDX; Frodge, MI)

Thanks to our contributors — Have you sent in YOUR logs?
Send to **Gayle Van Horn**, c/o *Monitoring Times* (or e-mail gayle@grove.net)
English broadcast unless otherwise noted.

You Asked for It !

A column jammed-packed with QSLs! That's right, we shift gears slightly from our usual opening to give our readers the latest reports. Enjoy!

BELARUS

Radio Minsk/Radio Belarus Intl, 11670 kHz. Full data QSL card signed by Irina Polozhentseva-English Program Editor, plus letter and frequency schedule. Received in 72 days for an English report and one U.S. dollar. Station address: vul. Chyrvonaya 4, 220807 Minsk, Rep. of Belarus. (Randy Stewart, Springfield, MO)

CAMBODIA

National Radio of Cambodia, 11940 kHz. Full data personal letter signed by Mr. Kem Yan-Director of International Relations. Two station stickers and two schedules enclosed. Received in 143 days for a taped report and one U.S. dollar. Station address: Monivong Boulevard No. 106, Phnom Penh, Cambodia. (Mickey Delmage, Edmonton, Alberta, Canada)

COASTAL RADIO

CW Station-IRM, 8685 MHz USB. Internationale Radio-Medical Centre (IRM) QSL signed by Nino Rizzo, M.D., Director, plus brochure explaining radio emergency services and medical advice to ship's crews worldwide. Received in 20 days for letter and two IRCs. Station address: Centro Internazionale Radio-Medico, 00144 Roma (EUR), Via dell'Architettura, 41, Italy. (J.R. Berry-K8UGL, Columbus, OH)

FM

WHEB, 100.3 MHz. Full data QSL signed by Road Kill, plus stickers. Received in six days for an FM report. Station address: P.O. Box 120, Portsmouth, NH 03802. (Ed Lindley, Biddeford, ME)

WOKQ, 97.5/103.7 MHz. Verification letter signed by Stan Edwards, plus schedule, key chain, magnet and T-shirt. Received in 20 days for an FM report. Station address: P.O. Box 576, Dover, NH 03820. (Lindley, ME)

GERMANY

Bayerischer Rundfunk-Munchen, 6085 kHz. Date/frequency logo card with illegible signature, plus three stickers. Received in 13 days for a taped report and one IRC (both returned with reply) Station address: Rundfunkplatz 1, D-80300 Munchen, Germany. (Delmage, CAN)

JAPAN

NHK/Radio Japan, 9505 kHz. Full data scenery card signed by Y. Fushimi, plus schedule, pocket calender, and report aerogram. Received in 25 days for an English report. Station address: Tokyo 150-8002 Japan. (Larry Zamora, Garland, TX) <www.nhk.or.jp/rjnet>

MAURITANIA

Radio Mauritanie, 4845 kHz. Full data QSL card stamped by Direction General-Secretariat but no signature. Received in two months for one dollar, Finland brochure, sent registered and certified to Abdallahi Ould Mohamedou-General Director. Station address: Boite Postal 200, Nouakchott, Rep. Islamic de Mauritanie. (Mauno Ritola, Finland/*Hard Core DX*)

MEDIUM WAVE

KBAH, 1660 kHz AM. Full data prepared QSL card signed by Don Neumuller-Chief Engineer. Received in 190 days for an AM report. Station address: 9 Caldwell Place, Elizabeth, NJ 07201. (Patrick Martin, Seaside, OR)

KCCF, 1550 kHz AM. Frequency only handwritten verification letter on KCCF station letterhead (Classics of the Christian Faith) signed by Matt Miller-General Manager. Received in 33 days for an AM report and mint stamps. Station address: P.O. Box 847, Ferndale, WA 98248. (Delmage, CAN)

KKFX, 910 kHz AM, Vancouver, WA. Full data letter signed by Larry Holtz-Managing Engineer. Received in 270 days for an AM report. Station address: 0700 Bancroft St., Portland, OR 97201. (Martin, OR)

KQEQ, 1210 kHz AM, Fowler, CA. Full data letter signed by Paul Shinn-Chief Engineer. Received in 48 days for an AM report. Station address: 139 W. Olive Ave., Fresno, CA 93728. (Martin, OR)

Radio Malaysia-Sarawak, 1161 kHz AM. Full data letter signed by Mohd. Hulman Abdullah for Director of Broadcasting. Received in 200 days for taped report. Station address: Broadcasting House, Jalan P. Ramlee 93614, Kuching, Sarawak, Malaysia. My fifth Malaysian medium wave QSL, two from Sabah, three from Sarawak. (Martin, OR)

WABC, 770 kHz AM. Full data card signed by Bill Krause, plus stickers. Received in 21 days for an AM report. Station address: 2 Penn Plaza, New York, NY 10121. (Lindley, ME)

WHAS, 840 kHz AM. Full data verification on station letterhead unsigned, plus schedule and coverage map. Received in 26 days for an AM report and mint stamps. Station address: 520 Chestnut, Louisville, KY 40202. (Tom Banks, Dallas, TX)

WJTO, 730 kHz AM. Full data QSL card signed by Bob Bittner. Received in 13 days for an AM report. Station address: P.O. Box 308, Bath, ME 04530. (Lindley, ME)

WOR, 710 kHz AM. Full data verification on station letterhead signed by Thomas Ray. Received in 15 days for an AM report and mint stamps. Station address: 1440 Broadway, New York, NY 10018. (Brian Bagwell, St. Louis, MO)

NETHERLANDS ANTILLES

BBC Antigua relay, 17840 kHz. Full data letter on Merlin Communications letterhead signed by Hild Myklebust-Team Assistant. Received in two weeks for an English report and two IRCs. Station address: 724 North East Wing, Bush House, P.O. Box 76, Strand, London WC2B 4PH, United Kingdom. (Bill Wilkins, Springfield, MO)

Deutsche Welle Antigua relay, 6040 kHz. Full data Cologne scenery card signed by B. Klamann-Transmitter Management. Received in 126 days for an English report. Station address: DW-Technische Beratung, D-50588 Koln, Germany. (Stewart, MO)

PIRATE

Happy Hanukkah, 6955 kHz USB. Full data Matzos sheet signed by Pirate Judah. Received in 77 days for an FRW log, plus enclosed a Manischewitz Savory Garlic Matzos box. QSL maildrop: P.O. Box 293, Merlin, Ontario N09 1W0. (Harold Frodge, Midland, MI)

With Glory to Gumby, 6955 kHz USB. Full data religious cartoon card signed by Steve Mann. Received in three days for a pirate report and three mint stamps. QSL maildrop: P.O. Box 28413, Providence, RI 02908. (Frodge, MI)

SPAIN

Radio Exterior de España, 6055 kHz. Full data microphone card unsigned. Received in 66 days for an English report and two IRCs. Station address: P.O. Box 156 202, Madrid 28080 Spain. (Wilkins, MO) <www.rtve.es/rne/ree/>

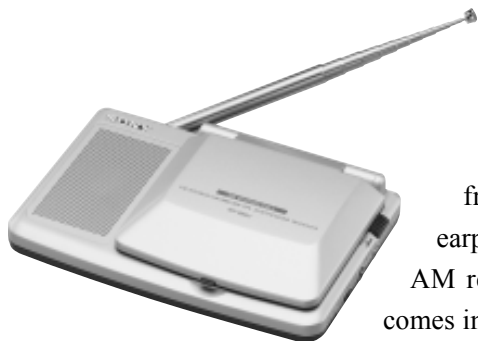
USA

KNLS, 7365 kHz. Full data Alaska scenery card #78, unsigned. Received in 30 days for an English report and mint stamps. Station address: Anchor Point, AK 99556. (Larry Zamora, Garland, TX) Website: <www.knls.org>

WWCR, 3210 kHz. Full data globe/antenna card unsigned, plus program schedule. Received in 63 days for an English report and two IRCs. Station address: 1300 WWCR Ave., Nashville, TN 37218. (Wilkins, MO)

WHRA, 17655 kHz. Full data World Map/WHRA card signed by Mr. Loren Holycross. Received in 189 days for an English report. Station address: World Harvest Radio, LeSEA Broadcasting, P.O. Box 12, South Bend, IN 46624. (Delmage, CAN)

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SONY!**



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Imagine a sleek, premium performance, short-wave portable that fits in your coat pocket! With performance rivaling the legend ICF-2010, this new, compact powerhouse tunes 150 kHz through 30 MHz, storing frequencies in 100 alpha-numeric memory channels.

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A variable attenuator resists strong-signal overload when used with an external antenna or the AN-LP2 active loop antenna (included at no extra charge), and the tone control contours sound to your liking. The 24 hour clock/sleep/timer invites programmed listening, and the backlit LCD readout shows frequency to 1 kHz accuracy, while the radio is powered from its AC adaptor (included) or two optional AA cells. Measures a scant 5-1/2"W x 1-1/4"H x 3-1/2"D.

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R75 COMMUNICATIONS RECEIVER!

With the R71 and R72 now long gone, Icom has released their newest communications receiver, the R75! Offering continuous 30 kHz-60 MHz frequency coverage, twin passband tuning, computer compatibility, and all-mode reception (USB/LSB/CW/RTTY/AM/AM synch/NFM), this triple-conversion R75 is hot! Short-wave sensitivity is 0.16 microvolts (SSB), and image/spurious signal rejection is better than 70 dB! Store active frequencies in up to 99 memory channels, and activate the receiver with its clock/timer.

Selectivity is optimally 2.1 kHz (SSB/CW) and 6 kHz (AM), and two optional filters are available. Audio output is a beefy 3 watts, and the receiver is powered either from a 12 VDC system or its AC adaptor (included). A noise blanker, two-level preamplifier, and alphanumeric display are additional perks with this new-generation receiver. An optional DSP unit provides custom sound processing.



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How to Use the Shortwave Guide

1: Convert your time to UTC.

Eastern and Pacific Times are already converted to Coordinated Universal Time (UTC) at the top of each page. The rule is: convert your local time to 24-hour format; add (during Daylight Savings Time) 4, 5, 6, or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (8:30 pm Eastern, 5:30 pm Pacific).

2: Choose a program or station you want to hear.

Some selected programs appear on the lower half of the page for prime listening hours—space does not permit 24-hour listings.

Occasionally program listings will be followed by "See X 0000." This information indicates that the program is a rerun, and refers to a previous summary of the program's content. The letter stands for a day of the week, as indicated below, and the four digits represent a time in UTC.

S: Sunday T: Tuesday H: Thursday A: Saturday
M: Monday W: Wednesday F: Friday

3: Find the frequencies for the program or station you want to hear.

Look at the page which corresponds to the time you will be listening. Comprehensive frequency information for English broadcasts can be found at the top half of the page. All frequencies are in kHz.

The frequency listing uses the same day codes as the program listings; if a broadcast is not daily, those day codes will appear before the

station name. Irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

4: Choose the most promising frequencies for the time, location and conditions.

Not all stations can be heard and none all the time on all frequencies. To help you find the most promising frequency, we've included information on the target area of each broadcast. Frequencies beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible. Every frequency is followed by one of these target codes:

al:	alternate frequency	am:	The Americas
as:	Asia	na:	North America
au:	Australia	ca:	Central America
pa:	Pacific	sa:	South America
va:	various	eu:	Europe
do:	domestic broadcast	af:	Africa
om:	omnidirectional	me:	Middle East

Consult the propagation charts. To further help you find the right frequency, we've included charts at the back of this section which take into account conditions affecting the audibility of shortwave broadcasts. Simply pick out the region in which you live and find the chart for the region in which the station you want to hear is located. The chart indicates the optimum frequencies for a given time in UTC.

Hot News

COMPILED BY JIM FRIMMEL

• RADIO WORLDS.

Deutsche Welle is marking its 75 years of radio broadcasting in Germany and has published "Radio Worlds/Worlds of Radio," a richly illustrated brochure, to help commemorate the event. The brochure looks at the media world and prospects for its future. Write to Deutsche Welle, PR & Communications, 50588 Cologne, Germany for a free copy.

• FREE STUFF.

Visit Grove's website <www.grove-ent.com> and click on "Free Stuff" to view or download current information, including the US Frequency Allocation Chart, my monthly *WaveGuide* (broadcasts and programs that are easy-to-hear in North America), and graphics that depict the current broadcast schedules of *World of Radio*, *Communications World*, and *DXing with Cumbre*. Other mis-

cellaneous files will be made available as they are created, so check back often.

• DX SATURDAY NITE.

WWCR has put together a two-hour block of DX programming for Saturday night (UTC Sunday on 5070). Glenn Hauser's *World of Radio* starts things off at 0200, Kim Elliott's *Communications World* follows at 0230, and Mark Emanuele's *Spectrum* program wraps things up from 0300-0400.

These programs are nicely bracketed between HCJB's *DX Partyline* at 0100 and repeated at 0400 (9745/12015). If you're still up after 0500 you can get Spain's *Radio Waves* in the 0500 time slot (6055), followed by *DXing with Cumbre* at 0600 via Angel 3 (17780).

• RADIO FEST '99.

The Ontario DX Association invites radio enthusiasts of all inter-

ests and all levels to join them for Radio Fest 99. The event will be held Sep 24-26, Ramada Inn & Convention Centre, Oakville, Ontario. For further details see <www.durhamradio.com/odxa/>.

• INTERNET RADIO.

The number of actual and Internet-only radio stations that broadcast their signals over the Internet has reached 2,200, of which 185 are web-only "stations" and 50 are radio networks. The total is expected to climb to 3,000 by year's end.

During the recent National Association of Broadcasters convention, a panel of webcasting heavyweights told several hundred broadcasters to get on the net now or get left in the dust.

• SUNSPOTS/SOLAR

CYCLES. A good source of current information about this

topic and how it affects radio propagation can be found on the Internet <www.sunspotcycle.com/>. Be sure to check out the interesting links at this web site.

• NOAA RADIO.

A paragliding hobbyist in Colorado advises that he uses his ham 2-meter radio to check local weather conditions before venturing out. He also reports that NOAA's automated weather service uses Apple's Macintalk speech recognition software.

• SELECTED PROGRAMS.

Featured this month in the program listings is a complete BBC World Service program guide. Other broadcasters include Radio Canada International and Deutsche Welle. All reflect many changes from previous schedules.

FREQUENCIES

0000-0100	Anguilla, Caribbean Beacon	6090am				0000-0030	Thailand, Radio	9655af	9690af	11905af	
0000-0100 vl	Australia, ABC/Katherine	5025do				0000-0030	UK, BBC World Service	3915as	7110as	11945as	17615as
0000-0100 vl	Australia, ABC/Tent Creek	4910do				0000-0100	UK, BBC World Service	5965as	5970as	5975am	6175am
0000-0100	Australia, Radio	9660pa	12080va	15240pa	17580va			6195as	9410as	9590am	9915sa
		17750as	17795va	21740va				11955as	12095sa	15310as	15360as
								17790as			
0000-0015	Cambodia, Natl Radio Of	11940as				0000-0100	UK, Merlin Network One	3985eu	9600na	11985na	
0000-0100	Canada, CBC N Quebec Svc	9625do				0000-0100	Ukraine, R Ukraine Intl	5905eu	6020eu	6090eu	7320eu
0000-0100	Canada, CFRX Toronto	6070do						7410eu	9550eu	9640eu	12040na
0000-0100	Canada, CFVP Calgary	6030do				0000-0100	USA, KAJI Dallas TX	5810na	13815al		
0000-0100	Canada, CHNX Halifax	6130do				0000-0100	USA, KTVN Salt Lk City UT	15590am			
0000-0100	Canada, CKZN St John's	6160do				0000-0100	USA, KWHR Naalehu HI	17510as			
0000-0100	Canada, CKZU Vancouver	6160do				0000-0030	USA, Voice of America	7115as	9770as	11760as	15185as
0000-0059	Canada, R Canada Intl	5960am	9755am					15290as	17735as	17820as	
0000-0100	Costa Rica, RF Peace Intl	6975am	15050am	21460am		0000-0100 twhfa	USA, Voice of America	5995am	6130ca	7405am	9455af
0000-0027	Czech Rep, R Prague Intl	11615na	13580na					9775am	11695ca	13740am	
0000-0100	Ecuador, HCJB	9745na	12015na	21455va		0000-0100	USA, WBCQ Monticello ME	7415na			
0000-0030	Egypt, Radio Cairo	9900am				0000-0100	USA, WEWN Birmingham AL	5825na	5850eu	13615na	
0000-0100 vl	Guatemala, Radio Cultural	3300do				0000-0100	USA, WGTG McCaysville GA	5085am	6890na		
0000-0100	Guyana, GBC/Voice of	3290al	5950do			0000-0100	USA, WHRA Greenbush ME	7385na			
0000-0045	India, All India Radio	7410as	9705as	9950as	11620as	0000-0100	USA, WHRI Noblesville IN	5745na	7315sa		
		13625as				0000-0100	USA, WINB Red Lion PA	11950ca			
0000-0015	Japan, Radio/NHK	6155eu	6180eu	9665af	11705na	0000-0100	USA, WJCR Upton KY	7490na	13595as		
		11815as	13650as			0000-0100 m	USA, WRMI/R Miami Intl	9955am			
0000-0100	Liberia, LCN/R Liberia Int	5100do				0000-0100	USA, WRNO New Orleans LA	7355na			
0000-0100	Malaysia, Radio	7295do				0000-0100	USA, WSHB Cypress Crk SC	7535al	9430na	15285am	
0000-0100	Malaysia, RTM Sarawak	7160do				0000-0100 as	USA, WWBS Macon GA	11900na			
0000-0100 vl	Malaysia, RTM Kota Kinabalu	5980do				0000-0100	USA, WWCR Nashville TN	3215na	5070na	7435na	13845na
0000-0100 vl	Namibia, NBC	3270af	3289af			0000-0100	USA, WYFR Okeechobee FL	6085na	9505na		
0000-0100	Netherlands, Radio	6165na	9845na			0000-0030 vl	Vanuatu, Radio	4960do			
0000-0100	New Zealand, R NZ Intl	17675pa				0015-0100	Japan, Radio/NHK	6155eu	6180eu	9665af	11705na
0000-0100	North Korea, R Pyongyang	11845am	13650am	15230am		0030-0100	Austria, R Austria Intl	9655na			
0000-0100 vl	Papua New Guinea, NBC	9675do				0030-0100	Iran, VOIRI	6060na	9022eu	9685am	
0000-0030 mtwhfa	Serbia, Radio Yugoslavia	9580na				0030-0000	Lithuania, Radio Vilnius	9855na			
0000-0100	Singapore, R Corp Singapore	6150do				0030-0100 vl	Solomon Islands, SIBC	5020do			
0000-0100	Spain, R Exterior Espana	15385na				0030-0100	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as	
0000-0100	Sri Lanka, IBC Tamil	7460as				0030-0100	Thailand, Radio	9655as	11905as	15395na	
						0050-0100	Italy, RAI Intl	9675na	11800na	15240na	

SELECTED PROGRAMS

Sundays

0000	BBC (AE/EAs): The World Today. The World Service breakfast program.
0000	BBC (AS): World News. Broadcast on the hour of 5, 10, or 15 minutes in length.
0005	BBC (AS): From Our Own Correspondent. BBC correspondents comment on the background to the news.
0030	BBC (AE): Science Extra. Either Soundbyte (virtual games and the Internet) or Seeing Stars (a look at the night skies).
0030	BBC (AS): Agenda. This series examines the latest ideas and trends.
0045	BBC (AE): Waveguide (27th). The latest information on international broadcasting with reviews of receivers and news about reception.
0045	BBC (AE): Write On. Air your views about World Service; write to PO Box 76, Bush House, Strand, London WC2B 4PH.

Mondays

0000	BBC (AE): Chimes of Big Ben (1). Hear the famous bells at this time on the first Monday of each month.
0000	BBC (AE/AS): The World Today. See S 0000.
0005	BBC (AS): Health Matters. Keeps track of new developments in the world of medical science, as well as ways of keeping fit.
0030	BBC (AE): My Century. Moments from individuals' lives throughout the 20th century (5 or 30 mins).
0030	BBC (AS): Omnibus. See S 0430.

Tuesdays

0000	BBC (AE/AS): The World Today. See S 0000.
0005	BBC (AS): Discovery. In-depth look at scientific research.
0030	BBC (AE): Health Matters. See M 0005.

0030	BBC (AS): Pick of the World. See M 0430.
0055	BBC (AE): My Century. See M 0030.

Wednesdays

0000	BBC (AE/AS): The World Today. See S 0000.
0000	BBC (AS): World News. See S 0000.
0005	BBC (AS): One Planet. Charles Haviland and Richard Black host this new program about development and the environment.
0030	BBC (AE): Discovery. See T 0005.
0030	BBC (AS): Sports International. Live commentaries and interviews, features and discussions.
0055	BBC (AE): My Century. See M 0030.

Thursdays

0000	BBC (AE/EAs/SAs): The World Today. See S 0000.
0000	BBC (AS): World News. See S 0000.
0005	BBC (AS): The Works. Alun Lewis looks at the impact of tomorrow's technology.
0030	BBC (AE): One Planet. See W 0005.
0030	BBC (AS): Assignment. A weekly examination of a topical issue.
0055	BBC (AE): My Century. See M 0030.

Fridays

0000	BBC (AE/EAs/SAs): The World Today. See S 0000.
0000	BBC (AS): The World Today (SAs). See S 0000.
0000	BBC (AS): World News. See S 0000.
0005	BBC (AS): Science in Action. The latest in science and technology.
0030	BBC (AE): The Works. See H 0005.
0030	BBC (AS): Focus on Faith. Alison Hilliard talks to church leaders about their hopes for the future.
0055	BBC (AE): My Century. See M 0030.

Saturdays

0000	BBC (AE/EAs): The World Today. See S 0000.
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0000	BBC (AS): World News. See S 0000.
0005	BBC (AS): Waveguide (26th). See S 0045.
0005	BBC (AS): Write On. See S 0045.
0030	BBC (AE): Science in Action. See F 0005.
0030	BBC (AS): People and Politics. Background to the British political scene.
0055	BBC (AE): My Century. See M 0030.

HAUSER'S HIGHLIGHTS

SOUTH AFRICA: CHANNEL AFRICA

A99 schedules in English:

UTC	Freq	Target
0300-0330	5955	East & Central Africa
0400-0430	5955	Southern Africa
0500-0530	11720	West Africa
0600-0630	15215	West Africa
1300-1455	21530	WAfrica (weekends only)
1300-1455	17860	E & C Africa (weekends only)
1300-1455	11900	S Africa (weekends only)
1500-1530	17870	East & Central Africa
1600-1630	6150	Southern Africa
1700-1730	17860	West Africa
1800-1830	17870	West Africa
(Kathy Otto, SENTECH)		

FREQUENCIES

0100-0200	Anguilla, Caribbean Beacon	6090am				0100-0130	Slovakia, R Slovakia Intl	5930na	7300ca	9440sa
0100-0200 vl	Australia, ABC/Katherine	5025do				0100-0200 vl	Solomon Islands, SIBC	5020do		
0100-0200 vl	Australia, ABC/Tent Creek	4910do				0100-0200	Spain, R Exterior Espana	15385na		
0100-0200	Australia, Radio	9660pa	12080va	15240pa	15415as	0100-0200	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as
		17750as	17795va	21740va		0100-0130	Switzerland, Swiss R Intl	9885am	9905am	
0100-0200	Canada, CBC N Quebec Svc	9625do				0100-0200	UK, BBC World Service	5970sa	5975am	6175am
0100-0200	Canada, CFRX Toronto	6070do						9410as	9590am	9915sa
0100-0200	Canada, CFVP Calgary	6030do						12095sa	15280as	15310as
0100-0200	Canada, CHNX Halifax	6130do						17790as		
0100-0200	Canada, CKZN St John's	6160do				0100-0200	UK, Merlin Network One	3985eu	9600na	11875na
0100-0200	Canada, CKZU Vancouver	6160do				0100-0200	USA, KAIJ Dallas TX	5810na	9815al	
0100-0130	Canada, R Canada Intl	5960na	9535am	9755am	11715am	0100-0200	USA, KJES Vado NM	7555na		
		13670am				0100-0200	USA, KTVN Salt Lk City UT	7510na		
0100-0200	Costa Rica, RF Peace Intl	6975am	15050am	21460am		0100-0200	USA, KWHR Naalehu HI	17510as		
0100-0105	Croatia, Croatian Radio	9925na				0100-0200	USA, Voice of America	7115as	7200as	9635as
0100-0200	Cuba, Radio Havana	6000na	9820na	11705na	13605na			11725as	11820as	15250as
0100-0127	Czech Rep, R Prague Intl	7345na	11615na					17820as		
0100-0200	Ecuador, HCJB	9745na	12015na	21455va		0100-0200 twfha	USA, Voice of America	5995am	6130am	7405am
0100-0145	Germany, Deutsche Welle	6040na	6145na	9640am	11810na			9775am	13740am	9455af
		13720am				0100-0200	USA, WBCQ Monticello ME	7415na		
0100-0200 s	Germany, Good News World	6155eu				0100-0200	USA, WEWN Birmingham AL	5825na	5850eu	13615na
0100-0200 s	Germany, Universal Life	15190eu				0100-0200	USA, WGTG McCaysville GA	5085am	6890na	
0100-0130 m	Germany, V O Deliverance	9855na				0100-0200	USA, WHRA Greenbush ME	7385na		
0100-0200 vl	Guatemala, Radio Cultural	3300do				0100-0200	USA, WHRI Noblesville IN	5745na	7315sa	
0100-0200	Guyana, GBC/Voice of	3290al	5950do			0100-0200	USA, WINB Red Lion PA	11950ca		
0100-0130	Hungary, Radio Budapest	9560na				0100-0200	USA, WJCR Upton KY	7490na	13595as	
0100-0200	Indonesia, Voice of	9525va				0100-0130 mtwhf	USA, WRMI/R Miami Intl	9955am		
0100-0130	Iran, VOIRI	6060na	9022eu	9685am		0100-0200	USA, WRNO New Orleans LA	7355na		
0100-0110	Italy, RAI Intl	9675na	11800na	15240na		0100-0200	USA, WSHB Cypress Crk SC	7535al	9430na	15285am
0100-0200	Japan, Radio/NHK	9660me	11860as	11870me	15570as	0100-0200	USA, WWCR Nashville TN	3215na	5070na	5935na
		15590as	17685pa	17835sa	21670pa	0100-0200	USA, WYFR Okeechobee FL	6065na	9505na	15165as
0100-0200	Kenya, Kenya BC Corp	4885do				0100-0130	Uzbekistan, R Tashkent	5975as	7105as	7285as
0100-0200	Liberia, LCN/R Liberia Int	5100do						5940na		9540as
0100-0200	Malaysia, Radio	7295do				0100-0127	Vietnam, Voice of	15235va	15415va	15435va
0100-0200 vl	Malaysia, RTM Kota Kinabalu	5980do				0130-0200 vl	Canada, R Canada Intl	5960na	9755am	
0100-0200 vl	Namibia, NBC	3270af	3289af			0130-0200 sm	Canada, R Canada Intl	9535am	11715am	13670am
0100-0125	Netherlands, Radio	6165na	9845na			0130-0200	Sweden, Radio	13625as		
0100-0200	New Zealand, R NZ Intl	17675pa				0130-0200 twfha	USA, Voice of America	5995am	6130am	9455af
0100-0200 vl	Papua New Guinea, NBC	9675do				0130-0200 a	USA, WRMI/R Miami Intl	9955am		
0100-0200	Philippines, FEBC R Intl	15450as				0140-0150	Greece, Voice of	7450na	9420na	11645na
0100-0200	Russia, Voice of Russia WS	9665na	12050na	15520na	15595na	0140-0200	Vatican City, Vatican R	7335au	9650au	15630na
0100-0200	Singapore, R Corp Singapore	6150do				0145-0200	Albania, R Tirana Intl	6115na	7160na	

SELECTED PROGRAMS

Sundays

0100	BBC (AE/AS): The World Today. See S 0000.	0100	Canada, RCI Montreal: RCI News. See S 0100.
0100	Canada, RCI Montreal: RCI News. News, weather, and sports from Radio Canada International.	0105	BBC (AS): Insight. See M 1645.
		0111	Canada, RCI Montreal: Spectrum. See M 1340.
0107	Canada, RCI Montreal: Venture Canada. David Blair presents this weekly magazine that promotes Canadian business ventures.	0120	BBC (AS): Discovery. See T 0005.
		0130	BBC (AE): Westway. The World Service's first-ever regular drama (soap opera) serial.
0130	BBC (AE): Music Review. News and views from the world of music.	0145	BBC (AE): Record News. See M 0415.
		0145	BBC (AS): Off the Shelf. See M 0145.
0130	BBC (AS): Global Business. Roger White presents this weekly series of interviews, features and discussions with the movers and shakers of the international business community.	0155	Canada, RCI Montreal: News. News from either the Canadian Broadcasting Corporation (CBC) or Radio Canada International (RCI).
0131	Canada, RCI Montreal: Earth Watch. The magazine on environment, science and ecology matters.		

Mondays

0100	BBC (AE): The World Today. See S 0000.
0100	BBC (AS): World News. See S 0000.
0100	Canada, RCI Montreal: RCI News. See S 0100.
0105	BBC (AS): The Farming World. See S 0415.
0107	Canada, RCI Montreal: The Arts in Canada. See S 0506.
0120	BBC (AS): Health Matters. See M 0005.
0130	BBC (AE): Meridian Feature. A kaleidoscope of events in the world of the arts.
0131	Canada, RCI Montreal: The Mailbag. See S 1336.
0145	BBC (AS): Off the Shelf. Daily readings from the best of world literature.

Tuesdays

0100	BBC (AE): The World Today. See S 0000.
0100	BBC (AS): World News. See S 0000.

Wednesdays

0100	BBC (AE): The World Today. See S 0000.
0100	BBC (AS): World News. See S 0000.
0100	Canada, RCI Montreal: RCI News. See S 0100.
0105	BBC (AS): Insight. See M 1645.
0111	Canada, RCI Montreal: Spectrum. See M 1340.
0120	BBC (AS): One Planet. See W 0005.
0130	BBC (AE): On Screen. See T 0430.
0145	BBC (AS): Off the Shelf. See M 0145.
0155	Canada, RCI Montreal: News. See T 0155.

Thursdays

0100	BBC (AE): The World Today. See S 0000.
0100	BBC (AS): World News. See S 0000.
0100	Canada, RCI Montreal: RCI News. See S 0100.
0105	BBC (AS): Insight. See M 1645.
0111	Canada, RCI Montreal: Spectrum. See M 1340.
0120	BBC (AS): The Works. See H 0005.
0130	BBC (AE): Meridian Live. See W 0430.
0145	BBC (AS): Off the Shelf. See M 0145.
0155	Canada, RCI Montreal: News. See T 0155.

Fridays

0100	BBC (AE): The World Today. See S 0000.
0100	BBC (AS): World News. See S 0000.
0100	Canada, RCI Montreal: RCI News. See S 0100.
0105	BBC (AS): Insight. See M 1645.
0111	Canada, RCI Montreal: Spectrum. See M 1340.
0120	BBC (AS): Science in Action. See F 0005.
0130	BBC (AE): Westway. See T 0130.
0145	BBC (AE): Performance. John Stearne explores each week one of the great voices of the century.
0145	BBC (AS): Off the Shelf. See M 0145.
0155	Canada, RCI Montreal: News. See T 0155.

Saturdays

0100	BBC (AE/AS): The World Today. See S 0000.
0100	BBC (AS): World News (EAs). See M 1100.
0100	Canada, RCI Montreal: RCI News. See S 0100.
0105	BBC (AS): The Edge (hour 1) (EAs). The first hour of a two-hour show of music, chat and humor, aimed at younger listeners (hosted by Kirsten O'Brien and Steve Merchant).
0111	Canada, RCI Montreal: Spectrum. See M 1340.
0130	BBC (AE): Meridian Books. See H 0430.
0130	BBC (AS): Variable Feature. See S 0601.
0155	Canada, RCI Montreal: News. See T 0155.

FREQUENCIES

0200-0300	Anguilla, Caribbean Beacon	6090am				0200-0300	South Korea, R Korea Intl	7275as	11725sa	11810sa	15575na
0200-0300 twhfa	Argentina, RAE	11710am				0200-0300	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as	
0200-0300 vl	Australia, ABC/Katherine	5025do				0200-0300	Taiwan, Radio Taipei Intl	5950na	9680na	11740	11745va
0200-0300 vl	Australia, ABC/Tent Creek	4910do						11825pa	15345as		
0200-0300	Australia, Radio	9660pa	12080va	15240pa	15415as	0200-0300	UK, BBC World Service	5970sa	5975am	6175am	6185am
		15510va	17580va	17750as	21725pa			6195eu	9410me	9770af	9915sa
								11955as	15280as	15310as	15360as
								17790as			
0200-0210	Bangladesh, Bangla Betar	4880as				0200-0300	UK, Merlin Network One	3985eu	9795na	11875na	
0200-0230 smwfa	Belarus, R Minsk	7210va	11670va			0200-0300	USA, KAJI Dallas TX	5810na	9815al		
0200-0300	Bulgaria, Radio	9400na	11700na			0200-0230	USA, KJES Vado NM	7555na			
0200-0300	Canada, CBC N Quebec Svc	9625do				0200-0300	USA, KTBN Salt Lk City UT	7510na			
0200-0300	Canada, CFRX Toronto	6070do				0200-0300 vl	USA, KVOH Los Angeles CA	9975am			
0200-0300	Canada, CFVP Calgary	6030do				0200-0300	USA, KWHR Naalehu HI	17510as			
0200-0300	Canada, CHNX Halifax	6130do				0200-0300	USA, Voice of America	7115as	7200as	9635as	11705as
0200-0300	Canada, CKZN St John's	6160do						11725as	11820as	15250as	17740as
0200-0300	Canada, CKZU Vancouver	6160do						17820as			
0200-0230	Canada, R Canada Intl	9535am	9755am	11715am	13670am	0200-0300	USA, WBCQ Monticello ME	7415na			
0200-0300	Costa Rica, RF Peace Intl	6975am	15050am	21460am		0200-0300	USA, WEWN Birmingham AL	5825va			
0200-0205	Croatia, Croatian Radio	9925na				0200-0300	USA, WGTG McCaysville GA	3270na	5085am	6090am	
0200-0300	Cuba, Radio Havana	6000na	9820na	11705na	13605na	0200-0300	USA, WHRA Greenbush ME	7385na			
0200-0300	Ecuador, HCJB	9745na	12015na	21455va		0200-0300	USA, WHRI Noblesville IN	5745na	7315sa		
0200-0300	Egypt, Radio Cairo	9475na				0200-0300	USA, WINB Red Lion PA	11950ca			
0200-0245	Germany, Deutsche Welle	9615as	9690as	11945as	11965as	0200-0300	USA, WJCR Upton KY	7490na	13595as		
		13690as	15560as			0200-0300	USA, WRNO New Orleans LA	7355na			
0200-0300	Germany, Overcomer Ministr	9860na				0200-0300	USA, WSHB Cypress Crk SC	5850al	7535na	9430na	
0200-0300	Guyana, GBC/Voice of	3290al	5950do			0200-0300	USA, WWCR Nashville TN	3215na	5070na	5935na	7435na
0200-0300 irreg	Iraq, Radio Iraq Intl	11785am				0200-0300	USA, WYFR Okeechobee FL	6065na	9505na		
0200-0300	Kenya, Kenya BC Corp	4935do				0210-0215 thfa/vl	Kyrgyzstan, Kyrgyz Radio	4010do	4050do		
0200-0300	Malaysia, Radio	7295do				0215-0220	Nepal, Radio	5005as	7165as		
0200-0230	Myanmar, Radio	7185do				0230-0300	Albania, R Tirana Intl	6115na	7160na		
0200-0300 vl	Namibia, NBC	3270af	3289af			0230-0300	Austria, R Austria Intl	9655na	9870ca		
0200-0300	New Zealand, R NZ Intl	17675pa				0230-0300 sm	Canada, R Canada Intl	9535am	9755am	11715am	13670am
0200-0230	Pakistan, Radio	15455as				0230-0300	Hungary, Radio Budapest	9840na			
0200-0300 vl	Papua New Guinea, NBC	9675do				0230-0245	Pakistan, Radio	9470as	11975as	13609as	15486as
0200-0300	Philippines, FEBC R Intl	15450as				0230-0300 vl	Philippines, R Pilipinas	11885as	15120as	15270as	
0200-0300	Romania, R Romania Intl	9510as	9570na	11725pa	11740na	0230-0300	Sweden, Radio	9495na			
		11810as	17735as			0230-0257	Vietnam, Voice of	5940na			
0200-0300	Russia, Voice of Russia WS	9665na	12020na	15520na	15595na	0250-0300	Vatican City, Vatican R	7305am	9605am		
0200-0300	Singapore, R Corp Singapore	6150do									
0200-0300 vl	Solomon Islands, SIBC	5020do									

SELECTED PROGRAMS

Sundays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 Canada, RCI Montreal: CBC Radio News. News, sports, and weather from the Canadian Broadcasting Corporation.
0206 Canada, RCI Montreal: The Vinyl Cafe. Host Stuart McLean with gossip and music from the neighborhood music store or with a live concert from around Canada.
0230 BBC (AE): World Business Review. A look back at the previous week's business and a preview of upcoming events.
0230 BBC (AF/AS): In Praise of God. Weekly programme of worship and meditation.
0245 BBC (AE): Letter from America. Alistair Cooke shares his inimitable view of contemporary American life.

Mondays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0206 Canada, RCI Montreal: Tapestry. A look at the broad range of spiritual and human issues facing people of various cultures and religions.
0230 BBC (AE): Global Business. See S 0130.
0230 BBC (AF): Blues World. Tony Russell returns with a new series about the blues.
0230 BBC (AS): Everywoman. See S 1130.

Tuesdays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0211 Canada, RCI Montreal: Spectrum. See M 1340.
0230 BBC (AE): World Business Report. See M 1205.
0230 BBC (AF): Variable Feature. See S 0601.

- 0230 BBC (AS): John Peel. Tracks from newly released albums and singles from the contemporary music scene.
0245 BBC (AE): Insight. See M 1645.

Wednesdays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0211 Canada, RCI Montreal: Spectrum. See M 1340.
0230 BBC (AE): World Business Report. See M 1205.
0230 BBC (AF): Everywoman. See S 1130.
0230 BBC (AS): The Vintage Chart Show. See M 0530.
0245 BBC (AE): Insight. See M 1645.

Thursdays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0211 Canada, RCI Montreal: Spectrum. See M 1340.
0230 BBC (AE): World Business Report. See M 1205.
0230 BBC (AF): On Screen. See T 0430.
0230 BBC (AS): Blues World. See M 0230.
0245 BBC (AE): Insight. See M 1645.

Fridays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0211 Canada, RCI Montreal: Spectrum. See M 1340.
0230 BBC (AE): World Business Report. See M 1205.
0230 BBC (AF/AS): Andy Kershaw's World of Music. See W 0530.
0245 BBC (AE): Insight. See M 1645.

Saturdays

- 0200 BBC (AE/AF/AS): The World Today. See S 0000.
0200 BBC (AS): World News (EAs). See M 1100.
0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0205 BBC (AS): The Edge (hour 2) (EAs). The second hour

- of a two-hour show of music, chat and humor, aimed at younger listeners.
0211 Canada, RCI Montreal: Spectrum. See M 1340.
0230 BBC (AE): World Business Report. See M 1205.
0230 BBC (AF): Jazzmatazz. See M 0530.
0230 BBC (AS): Composer of the Month. See M 1530.
0245 BBC (AE): Insight. See M 1645.

HAUSER'S HIGHLIGHTS

TURKEY: VOICE OF TURKEY

A99 English schedule on web site:

Target	UTC	Freqs
Europe	0300-0400	11655
	1230-1330	17830
	1830-1930	11765 13695
	2200-2300	7190 13640
Africa	0300-0400	7270
Australia	0300-0400	21715
	1230-1330	17560
	2030-2130	7170
	0300-0400	11655
North America	2200-2300	13640
	0300-0400	7270 21715
	1230-1330	17560
	2030-2130	7170

(Mike Barraclough, England)

FREQUENCIES

0300-0400	Anguilla, Caribbean Beacon	6090am			
0300-0400 vl	Australia, ABC/Katherine	5025do			
0300-0400 vl	Australia, ABC/Tent Creek	4910do			
0300-0400	Australia, Radio	9660pa	12080as	15240pa	15415as
		15510va	17580va	17750as	21725pa
0300-0400	Australia, Defense Forces R	14790as			
0300-0400 vl	Botswana, Radio	4820do	7255do		
0300-0400	Canada, CBC N Quebec Svc	9625do			
0300-0400	Canada, CFRX Toronto	6070do			
0300-0400	Canada, CFVP Calgary	6030do			
0300-0400	Canada, CHNX Halifax	6130do			
0300-0400	Canada, CKZN St John's	6160do			
0300-0400	Canada, CKZU Vancouver	6160do			
0300-0400	China, China Radio Intl	9690na			
0300-0400	Costa Rica, RF Peace Intl	6975am			
0300-0305	Croatia, Croatian Radio	9925na			
0300-0400	Cuba, Radio Havana	6000na	9820na	11705na	13605na
0300-0327	Czech Rep, R Prague Intl	7345na	9955na	11615na	
0300-0400	Ecuador, HCJB	9745na	12015na	21455va	
0300-0330	Egypt, Radio Cairo	9475am			
0300-0345	Germany, Deutsche Welle	6145na	9535na	9640na	11810na
		13780am	15105na		
0300-0400	Germany, Overcomer Ministr	9860na			
0300-0400 vl	Guatemala, Radio Cultural	3300do			
0300-0400	Guyana, GBC/Voice of	3290al	5950do		
0300-0400	Japan, Radio/NHK	17825ca	21610pa		
0300-0400	Kenya, Kenya BC Corp	4885do	4935do		
0300-0400 vl	Lesotho, Radio	4800do			
0300-0400	Malaysia, Radio	7295do			
0300-0330 stwhfa	Mexico, Radio Mexico Intl	5985al	9705am		
0300-0325	Moldova, R Moldova Intl	7520na			
0300-0400 vl	Namibia, NBC	3270af	3289af		
0300-0400	New Zealand, R NZ Intl	17675pa			
0300-0400 vl	Papua New Guinea, NBC	9675do			
0300-0330 vl	Philippines, R Pilipinas	11885as	15120as	15270as	
0300-0400	Russia, Voice of Russia WS	7125na	9665na	12050na	15595na
		17565na	17630na	17660na	17690na
0300-0330	S Africa, Channel Africa	5955af			
0300-0400	Singapore, R Corp Singapore	6150do			
0300-0400	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as	
0300-0400	Taiwan, Radio Taipei Intl	5950na	9680na	11745as	11825as
		15345as			
0300-0330	Thailand, Radio	9655am	11905am	15395na	
0300-0400	Turkey, Voice of	7270va	11655va	21715va	
0300-0400	Uganda, Radio	4976do			
0300-0400	UK, BBC World Service	3255af	5975am	6005af	6175am
		6180eu	6185am	6190af	7160af
		9410eu	11730af	11760me	11765af
		11955as	12095af	15280as	15310as
		15420af	17760as	17790as	21660as
0300-0320	UK, BBC World Service	15360as			
0300-0400	UK, Merlin Network One	3985eu	9795na		
0300-0400	Ukraine, R Ukraine Intl	6020eu	7410eu	9550na	9620eu
		9640eu	12040na	13590eu	
0300-0400	USA, KAJI Dallas TX	5810na	9815al		
0300-0400	USA, KTVN Salt Lk City UT	7510na			
0300-0400 vl	USA, KVOH Los Angeles CA	9975am			
0300-0400	USA, KWHR Naalehu HI	17510as			
0300-0330 smtwh	USA, Voice of America	4960af			
0300-0400	USA, Voice of America	6080af	7105af	7275af	7290af
		7340af	9575af	9885af	
0300-0400	USA, WBCQ Monticello ME	7415na			
0300-0400	USA, WEWN Birmingham AL	5825va			
0300-0400	USA, WGTG McCaysville GA	3270na	5085am	6890am	
0300-0400	USA, WHRA Greenbush ME	7385na			
0300-0400	USA, WHRI Noblesville IN	5745na	7315sa		
0300-0400	USA, WINB Red Lion PA	11950ca			
0300-0400	USA, WJCR Upton KY	7490na	13595as		
0300-0400	USA, WRMI/R Miami Intl	9955am			
0300-0400	USA, WRNO New Orleans LA	7395na			
0300-0400	USA, WSHB Cypress Crk SC	11930eu			
0300-0400	USA, WWCN Nashville TN	3215na	5070na	5935na	7435na
0300-0400	USA, WYFR Okeechobee FL	6065na	9505na		
0300-0310	Vatican City, Vatican R	7305am	9605am		
0300-0327	Vietnam, Voice of	5905ca			
0300-0400	Zambia, Natl BC Corp	6165do	6265do		
0300-0400 vl	Zimbabwe, Zimbabwe BC	3306do	4828do		
0310-0340	Vatican City, Vatican R	9660af			
0330-0357	Czech Rep, R Prague Intl	11600as	15530as		
0330-0350 vl	Libya, Voice of Africa	15235va	15415va	15435va	
0330-0400 vl	Philippines, R Pilipinas	13770as	15330as	17730as	
0330-0400	Sweden, Radio	9495na	12060na		
0330-0400	Tanzania, Radio	5050af			
0330-0400	UAE, Radio Dubai	12005na	13675na	15400na	21485na
0340-0350	Greece, Voice of	7450na	11645na	15630na	
0345-0400	Tajikistan, Radio	7245as	9905as	11620as	
0356-0400	Zambia, Christian Voice	3330af	6065af		

SELECTED PROGRAMS

Sundays

0300	BBC (AE/AF): The World Today. See S 0000.
0300	BBC (AS): World News. See S 0000.
0305	BBC (AS): Wright Round the World. Steve Wright's brand new show with listeners' requests and dedications.
0320	BBC (AE/AF): Sports Roundup. The latest sports news.
0330	BBC (AE): Agenda. See S 0030.
0330	BBC (AF): Postmark Africa. Expert answers to any question under the sun.

Mondays

0300	BBC (AE/AF/AS): The World Today. See S 0000.
0320	BBC (AE/AF): Sports Roundup. See S 0320.
0320	BBC (AS): Talking Point. See S 1405.
0330	BBC (AE): Westway Compilation Edition (Am). See S 0530.
0330	BBC (AF): Network Africa. Breakfast show of news, sport, personalities, music, and listener's comments.

Tuesdays

0300	BBC (AE/AF/AS): The World Today. See S 0000.
0320	BBC (AE/AF): Sports Roundup. See S 0320.
0320	BBC (AS): Outlook. See M 1205.
0330	BBC (AE): Variable Feature (Am). See S 0601.
0330	BBC (AF): Network Africa. See M 0330.
0345	BBC (AE): Off the Shelf (Am). See M 0145.

Wednesdays

0300	BBC (AE/AF/AS): The World Today. See S 0000.
0320	BBC (AE/AF): Sports Roundup. See S 0320.

0320	BBC (AS): Outlook. See M 1205.
0330	BBC (AE): Variable Feature (Am). See S 0601.
0330	BBC (AF): Network Africa. See M 0330.
0345	BBC (AE): Off the Shelf (Am). See M 0145.

Thursdays

0300	BBC (AE/AF/AS): The World Today. See S 0000.
0320	BBC (AE/AF): Sports Roundup. See S 0320.
0320	BBC (AS): Outlook. See M 1205.
0330	BBC (AE): From Our Own Correspondent (Am). See S 0005.
0330	BBC (AF): Network Africa. See M 0330.
0345	BBC (AE): Off the Shelf (Am). See M 0145.

Fridays

0300	BBC (AE/AF/AS): The World Today. See S 0000.
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0320	BBC (AE/AF): Sports Roundup. See S 0320.
0320	BBC (AS): Outlook. See M 1205.
0330	BBC (AE): The Farming World (Am). See S 0415.
0330	BBC (AF): Network Africa. See M 0330.
0345	BBC (AE): Off the Shelf (Am). See M 0145.

Saturdays

0300	BBC (AE/AF/AS): The World Today. See S 0000.
0320	BBC (AE): Sports Roundup (Am). See S 0320.
0320	BBC (AF): Sports Roundup. See S 0320.
0320	BBC (AS): Outlook. See M 1205.
0330	BBC (AE): Variable Feature (Am). See S 0601.
0330	BBC (AE): Weekend (Eu). European magazine program co-produced by European broadcasters.
0330	BBC (AF): People and Politics. See A 0030.
0345	BBC (AE): Insight (Am). See M 1645.

HAUSER'S HIGHLIGHTS
SWEDEN: RADIO SWEDEN

English schedule effective 28 March to 30 October:

UTC	Target	Freqs	UTC	Target	Freqs
0130-0200	AsAu	13625	1330-1400	AsAuAm	15240 17505
0230-0300	NAm	9495	1730-1800	EuAfME	6065 (except Sun)
0330-0400	NAm	9495 12060	1730-1800	EuAfME	9590 (Sunday only)
1130-1200	NAm	18960 21810	1930-2000	EuAfME	1179 6065
1230-1300	AsAu	17895 21810	2130-2200	EuAfME	1179 6065 9430

(Tony Rogers, British DX Club)

FREQUENCIES

0500-0600	Anguilla, Caribbean Beacon	6090am			
0500-0600 vl	Australia, ABC/Katherine	5025do			
0500-0600 vl	Australia, ABC/Tent Creek	4910do			
0500-0600	Australia, Radio	9660pa	12080va	15240pa	15510va
		17580va	21725pa		
0500-0600 as	Australia, Radio	17750as			
0500-0600 vl	Botswana, Radio	4820do	7255do		
0500-0600	Canada, CBC N Quebec Svc	9625do			
0500-0600	Canada, CFRX Toronto	6070do			
0500-0600	Canada, CFVP Calgary	6030do			
0500-0600	Canada, CHNX Halifax	6130do			
0500-0600	Canada, CKZU Vancouver	6160do			
0500-0530	Canada, R Canada Intl	5995na	6145eu	7295eu	9595eu
		9755na	11830na	11930na	13755eu
		15330eu	15400eu		
0500-0600	Costa Rica, RF Peace Intl	6975am			
0500-0505	Croatia, Croatian Radio	13820au			
0500-0600	Cuba, Radio Havana	9550na	9820na	9830na	
0500-0600	Ecuador, HCJB	9745na	12015na	21455va	
0500-0545	Germany, Deutsche Welle	9615am	9670na	11795na	11810na
0500-0600	Guyana, GBC/Voice of	3290al	5950do		
0500-0600 as/vl	Italy, IRRS	3985va			
0500-0600	Japan, Radio/NHK	6110na	7230eu	11715as	11760as
		11840as	11850pa	15230pa	15590as
		17825na			
0500-0600	Kenya, Kenya BC Corp	4885do	4935do		
0500-0600 vl	Lesotho, Radio	4800do			
0500-0600	Liberia, LCN/R Liberia Int	5100do			
0500-0510 vl/m-f	Malawi, MBC	5993do			
0500-0600	Malaysia, Radio	7295do			
0500-0600	Malaysia, RTM Sarawak	7160do			
0500-0600	Malaysia, Voice of	6175as	9750as	15295au	
0500-0600 vl	Namibia, NBC	3270af	3289af		
0500-0525	Netherlands, Radio	6165na	9590na		
0500-0600	New Zealand, R NZ Intl	11905pa			
0500-0600 vl	Nigeria, Radio/Ibadan	6050do			
0500-0600 vl	Nigeria, Radio/Kaduna	4770do			
0500-0600	Nigeria, Radio/Lagos	3326do			
0500-0600	Nigeria, Voice of	7255af	15120va		
0500-0600	North Korea, R Pyongyang	3560as	11710eu	13790as	
0500-0600 vl	Papua New Guinea, NBC	9675do			
0500-0600	Russia, Voice of Russia WS	17625au	21790au		
0500-0530	S Africa, AWR Africa	5960af			
0500-0530	S Africa, Channel Africa	11720af			
0500-0600	Singapore, R Corp Singapore	6150do			
0500-0600 vl	Solomon Islands, SIBC	5020do			
0500-0556	Spain, R Exterior Espana	6055na			
0500-0505	Swaziland, Trans World R	3200af	4775af		
0500-0600	Uganda, Radio	4976do			
0500-0600	UK, BBC World Service	3255af	3955eu	5975am	6005af
		6175am	6180eu	6190af	6195eu
		7160af	9410eu	9740as	11760me
		11765af	11955pa	12095pa	15280as
		15310as	15360as	15420af	15475af
		15575as	17640af	17760as	17885af
		21660as			
0500-0600	UK, Merlin Network One	6010eu			
0500-0600	USA, KAJ Dallas TX	5810na	9815al		
0500-0600	USA, KTNB Salt Lk City UT	7510na			
0500-0600	USA, KWHR Naalehu HI	17780as			
0500-0600	USA, Voice of America	5970af	6035af	6080af	7170af
		7195af	9630af	11965me	12080af
		15205va			
0500-0600	USA, WBCQ Monticello ME	7415na			
0500-0600	USA, WEWN Birmingham AL	5825va			
0500-0600	USA, WGTG McCaysville GA	3270na	5085am		
0500-0600	USA, WHRA Greenbush ME	11565af			
0500-0600	USA, WHRI Noblesville IN	5745na	7315sa		
0500-0600	USA, WINB Red Lion PA	11950ca			
0500-0600	USA, WJCR Upton KY	7490na	13595as		
0500-0600	USA, WRNO New Orleans LA	7395na			
0500-0600	USA, WSHB Cypress Crk SC	9840af	11930eu		
0500-0600	USA, WWCR Nashville TN	2390na	3210na	5070na	5935na
0500-0600	USA, WYFR Okeechobee FL	5985na	9985eu	11580eu	
0500-0520	Vatican City, Vatican R	4005eu	5883eu	7250eu	9660af
		11625af	15570af		
0500-0600	Zambia, Christian Voice	3330af	6065af		
0500-0600	Zambia, Natl BC Corp	6165do	6265do		
0500-0530 vl	Zimbabwe, Zimbabwe BC	3306do	4828do		
0505-0600 mtwhf	Swaziland, Trans World R	4775af	6100af	9500af	
0520-0530	Vatican City, Vatican R	9660af	11625af	15570af	
0530-0600	Austria, R Austria Intl	6015na			
0530-0600 vl	Ghana, Ghana BC Corp	3366do	4915do		
0530-0600	Switzerland, Swiss R Intl	13635eu			
0530-0600	Thailand, Radio	9655eu	11905eu	15445eu	
0530-0600	UAE, Radio Dubai	15435au	17830au	21605au	21700au
0530-0600 vl	Zimbabwe, Zimbabwe BC	4828do	5012do		

SELECTED PROGRAMS

Sundays

0500	BBC (AE/AF/AS): The World Today. See S 0000.	0530	BBC (AE): The UK Top Twenty (Am). See M 1615.	0530	BBC (AE): My Century. See M 0030.
0500	Canada, RCI Montreal: RCI News. See S 0100.	0530	BBC (AF): Network Africa. See M 0330.	0530	BBC (AF): Talkabout Africa. See W 1615.
0506	Canada, RCI Montreal: The Arts in Canada. David Blair takes a look at Canadian cultural events taking place across the country and around the world.	0530	BBC (AS): The UK Top Twenty. See M 1615.	0530	BBC (AS): Variable Feature. See S 0601.
0530	BBC (AE): In Praise of God (Eu). See S 0230.				
0530	BBC (AE): Play of the Week (Am). A different radio drama program each week (alternative programming for the Americas).				
0530	BBC (AF): Agenda. See S 0030.				
0530	BBC (AS): Westway Compilation Edition. Catch up on the week's episodes of the World Service's drama serial.				

Mondays

0500	BBC (AE/AF/AS): The World Today. See S 0000.				
0500	Canada, RCI Montreal: RCI News. See S 0100.				
0510	Canada, RCI Montreal: First Edition. Wojtek Gwiazda provides best way for listeners in Europe, Africa and the Middle East to get updated on the previous day's news and what's happening in Canada.				
0530	BBC (AE): Jazzmatazz (Am). The request program that lives up to its title.				
0530	BBC (AF): Network Africa. See M 0330.				
0530	BBC (AS): The Vintage Chart Show. Each week a classic Top 20 from the past with Paul Burnett.				

Tuesdays

0500	BBC (AE/AF/AS): The World Today. See S 0000.				
0500	Canada, RCI Montreal: RCI News. See S 0100.				
0510	Canada, RCI Montreal: First Edition. See M 0510.				

Wednesdays

0500	BBC (AE/AF/AS): The World Today. See S 0000.				
0500	Canada, RCI Montreal: RCI News. See S 0100.				
0510	Canada, RCI Montreal: First Edition. See M 0510.				
0530	BBC (AE): Andy Kershaw's World of Music (Am). Recordings of diverse music from around the world.				
0530	BBC (AF): Network Africa. See M 0330.				
0530	BBC (AS): Andy Kershaw's World of Music. See W 0530.				

Thursdays

0500	BBC (AE/AF/AS): The World Today. See S 0000.				
0500	Canada, RCI Montreal: RCI News. See S 0100.				
0510	Canada, RCI Montreal: First Edition. See M 0510.				
0530	BBC (AF): Network Africa. See M 0330.				
0530	BBC (AS): Blues World. See M 0230.				

Fridays

0500	BBC (AE/AF/AS): The World Today. See S 0000.				
0500	Canada, RCI Montreal: RCI News. See S 0100.				
0510	Canada, RCI Montreal: First Edition. See M 0510.				
0530	BBC (AE): John Peel (Am). See T 0230.				
0530	BBC (AF): Network Africa. See M 0330.				
0530	BBC (AS): Jazzmatazz. See M 0530.				

Saturdays

0500	BBC (AE/AF/AS): The World Today. See S 0000.				
0500	Canada, RCI Montreal: RCI News. See S 0100.				
0505	BBC (AS): The Edge (hour 2) (SAs). See A 0205.				
0506	Canada, RCI Montreal: Earth Watch. See S 0131.				

HAUSER'S HIGHLIGHTS

AUSTRALIA: R. AUSTRALIA

A-99 on beams favoring NAm from 100 kW Shepparton:

UTC	Freq	Degrees
2100-0200	21740	070
2100-0800	17580	030
2200-0200	17795	050
0200-0900	15510	070
0800-1200	13605	030
1200-1700	11650	030
1700-2100	9660	030
1100-2130	9580	070
1400-1800	6180	030
1700-2200	11880	065
1800-2000	7240	030

(RA Web site via John Norfolk, OK)

Feedback times rescheduled for A-99:

UTC Fri 2110, Sat 0030, 0610, Sun 0330.

Also check out *Media Report*

UTC Thu 2330 (gh)

FREQUENCIES

0600-0700	Anguilla, Caribbean Beacon	6090am			
0600-0700 vl	Australia, ABC/Katherine	5025do			
0600-0700 vl	Australia, ABC/Tent Creek	4910do			
0600-0700	Australia, Radio	9660pa	12080va	15240pa	15415as
		15510va	17580va	17750as	21725pa
		4820do	4830do	7255do	
0600-0700 vl	Botswana, Radio	9625do			
0600-0700 vl	Canada, CBC N Quebec Svc	6070do			
0600-0700	Canada, CFRX Toronto	6030do			
0600-0700	Canada, CFVP Calgary	6130do			
0600-0700	Canada, CHNX Halifax	6160do			
0600-0700	Canada, CKZU Vancouver	6975am			
0600-0700	Costa Rica, RF Peace Intl	13820au			
0600-0605	Croatia, Croatian Radio	9550na	9820na	9830na	
0600-0700	Cuba, Radio Havana	9745na	12015na	21455va	
0600-0700	Ecuador, HCJB	6140eu	11915af	13790af	15185af
0600-0645	Germany, Deutsche Welle	17820as	17860af	21680me	
		5850eu			
0600-0700	Germany, Sunrise Radio	13810au			
0600-0700	Germany, Overcomer Ministr	3366do	4915do		
0600-0700 vl	Ghana, Ghana BC Corp	3290al	5950do		
0600-0700	Guyana, GBC/Voice of	3985va			
0600-0630 vl	Italy, IRRS	5975eu	7230eu	11740as	11840as
0600-0700	Japan, Radio/NHK	11850pa	17825na		
		4885do	4935do		
0600-0700	Kenya, Kenya BC Corp	4800do			
0600-0700 vl	Lesotho, Radio	5100do			
0600-0700	Liberia, LCN/R Liberia Int	7295do			
0600-0700	Malaysia, Radio	7160do			
0600-0700	Malaysia, RTM Sarawak	6175as	9750as	15295au	
0600-0700	Malaysia, Voice of	3270af	3289af		
0600-0700 vl	Namibia, NBC	11905pa			
0600-0700	New Zealand, R NZ Intl	6050do			
0600-0700 vl	Nigeria, Radio/Ibadan	4770do			
0600-0700 vl	Nigeria, Radio/Kaduna	3326do			
0600-0700	Nigeria, Radio/Lagos	7255af	15120va		
0600-0700	Nigeria, Voice of	9675do			
0600-0700 vl	Papua New Guinea, NBC	11725na	11940na		
0600-0700	Romania, R Romania Intl	15490au	17615au	17655as	21790au
0600-0700	Russia, Voice of Russia WS	15215af			
0600-0630	S Africa, Channel Africa	3316do			
0600-0700	Sierra Leone, SLBS	6150do			
0600-0700	Singapore, R Corp Singapore	5020do			
0600-0700 vl	Solomon Islands, SIBC	4775af	6100af	9500af	
0600-0700 mtwhf	Swaziland, Trans World R				
0600-0700	UK, BBC World Service	5975am	6005af	6175am	6180eu
		6190af	6195eu	7145pa	7160af
		7325eu	9410eu	9740as	11760me
		11765af	11940af	11955pa	12095eu
		15310as	15360as	15400af	15420af
		15565eu	15575as	17640af	17760as
		17790as	17885af	21660as	
0600-0700	UK, Merlin Network One	6110eu	13720as		
0600-0700	USA, KALJ Dallas TX	5810na	9815al		
0600-0700	USA, KTVN Salt Lk City UT	7510na			
0600-0700	USA, KWHR Naalehu HI	11565pa	17780as		
0600-0630	USA, Voice of America	5970af	6035af	6080af	7170va
		9630af	9680af	11805af	11965me
		11995af	12080af	15205va	
0600-0700	USA, WBCQ Monticello ME	7415na			
0600-0700	USA, WEWN Birmingham AL	5825va			
0600-0700	USA, WHRA Greenbush ME	11565af			
0600-0700	USA, WHRI Noblesville IN	5745na	7315sa		
0600-0700	USA, WINB Red Lion PA	11950ca			
0600-0700	USA, WJCR Upton KY	7490na	13595as		
0600-0700	USA, WRNO New Orleans LA	7395na			
0600-0700	USA, WSHB Cypress Crk SC	13650af			
0600-0700	USA, WWCR Nashville TN	2390na	3210na	5070na	5935na
0600-0700	USA, WYFR Okeechobee FL	5985na	7355eu		
0600-0700 vl	Vanuatu, Radio	4960do			
0600-0700	Yemen, Rep of Yemen Radio	9780do			
0600-0700	Zambia, Christian Voice	3330af	6065af		
0600-0700	Zambia, Natl BC Corp	6165do	6265do		
0600-0700 vl	Zimbabwe, Zimbabwe BC	4828do	5012do		
0605-0610 mtwhfa	Croatia, Croatian Radio	5945eu	7365eu	9830eu	
0610-0615 s	Kyrgyzstan, Kyrgyz Radio	4010do	4050do		
0630-0700	Austria, R Austria Intl	6015na			
0630-0700	Finland, YLE/R Finland	15250va	21670as		
0630-0700	Georgia, Georgian Radio	11910eu			
0630-0700 as	Italy, IRRS	7120va			
0630-0700 as	UK, BBC World Service	17885af			
0630-0700	USA, Voice of America	7170af	9680af	11805af	11965me
		15205va			
0630-0700 as	USA, Voice of America	5970af	6035af	6080af	7195af
		9630af	11995af	12080af	
0630-0645	Vatican City, Vatican R	11625va	13765af	15570af	
0630-0645 mtwhfa	Vatican City, Vatican R	4005eu	5883eu	7250eu	9645eu
		11740eu	15595eu		
0640-0700	Romania, R Romania Intl	9625eu	11840eu	11885eu	15270eu
0645-0700	Germany, Deutsche Welle	6140eu			
0645-0655 as	Monaco, Trans World Radio	6045eu	9870eu		
0645-0700	Vatican City, Vatican R	11625va	13795af	15570af	
0655-0700 mtwhf	Monaco, Trans World Radio	6045eu	9870eu		

SELECTED PROGRAMS

Sundays

0600	BBC (AE/AF): World News. See S 0000.
0600	BBC (AS): News Summary. One minute news update.
0601	BBC (AE): Variable Feature. Special features and new series.
0615	BBC (AE): Letter from America. See S 0245.
0615	BBC (AF): Sports Roundup. See S 0320.
0630	BBC (AE): Agenda. See S 0030.
0630	BBC (AF): Postmark Africa. See S 0330.

Mondays

0600	BBC (AE/AF/AS): World News. See S 0000.
0615	BBC (AE): Talking Point. See S 1405.
0615	BBC (AF): Sports Roundup. See S 0320.
0615	BBC (AS): My Century. See M 0030.
0630	BBC (AF): Network Africa. See M 0330.
0630	BBC (AS): Health Matters. See M 0005.
0655	BBC (AE): My Century. See M 0030.

Tuesdays

0600	BBC (AE/AF/AS): World News. See S 0000.
0615	BBC (AE): Outlook. See M 1205.
0615	BBC (AF): Sports Roundup. See S 0320.
0615	BBC (AS): My Century. See M 0030.
0620	BBC (AS): Off the Shelf. See M 0145.
0630	BBC (AF): Network Africa. See M 0330.
0635	BBC (AS): Discovery. See T 0005.
0655	BBC (AE): My Century. See M 0030.

Wednesdays

0600	BBC (AE/AF/AS): World News. See S 0000.
0615	BBC (AE): Outlook. See M 1205.
0615	BBC (AS): My Century. See M 0030.
0620	BBC (AF): Sports Roundup. See S 0320.
0620	BBC (AS): Off the Shelf. See M 0145.
0630	BBC (AF): Network Africa. See M 0330.
0635	BBC (AS): One Planet. See W 0005.
0655	BBC (AE): My Century. See M 0030.

Thursdays

0600	BBC (AE/AF/AS): World News. See S 0000.
0615	BBC (AE): Outlook. See M 1205.
0615	BBC (AS): My Century. See M 0030.
0620	BBC (AF): Sports Roundup. See S 0320.
0620	BBC (AS): Off the Shelf. See M 0145.
0630	BBC (AF): Network Africa. See M 0330.
0635	BBC (AS): The Works. See H 0005.
0655	BBC (AE): My Century. See M 0030.

Fridays

0600	BBC (AE/AF/AS): World News. See S 0000.
0615	BBC (AE): Outlook. See M 1205.
0615	BBC (AS): My Century. See M 0030.
0620	BBC (AF): Sports Roundup. See S 0320.
0620	BBC (AS): Off the Shelf. See M 0145.
0625	BBC (AS): Take Five. A short series of human interest stories.
0630	BBC (AF): Network Africa. See M 0330.

0635	BBC (AS): Multitrack Alternative. Latest developments on the British music scene.
0655	BBC (AE): My Century. See M 0030.

Saturdays

0600	BBC (AE/AF/AS): World News. See S 0000.
0615	BBC (AE): Outlook. See M 1205.
0615	BBC (AS): Spotlight. See F 1440.
0620	BBC (AF): Sports Roundup. See S 0320.
0620	BBC (AS): Omnibus. See S 0430.
0630	BBC (AF): This Week and Africa. See A 0430.
0655	BBC (AE): Spotlight. See F 1440.

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0800 UTC

FREQUENCIES

0700-0800	Anguilla, Caribbean Beacon	6090am				
0700-0800 vl	Australia, ABC/Katherine	5025do				
0700-0800 vl	Australia, ABC/Tent Creek	4910do				
0700-0800	Australia, Radio	9660pa	12080va	15240pa	15415as	
		15510va	17580va	17750as	21725pa	
0700-0726	Belgium, R Vlaanderen Intl	9925eu	15195eu			
0700-0800 vl	Botswana, Radio	4820do	4830do	7255do		
0700-0800	Canada, CFRX Toronto	6070do				
0700-0800	Canada, CFVP Calgary	6030do				
0700-0800	Canada, CHNX Halifax	6130do				
0700-0800	Canada, CKZU Vancouver	6160do				
0700-0800	Costa Rica, RF Peace Intl	6975am				
0700-0705	Croatia, Croatian Radio	13820af				
0700-0727	Czech Rep, R Prague Intl	9880eu	11600eu			
0700-0800	Ecuador, HCJB	11855eu	15115pa	21455va		
0700-0800 as/vl	Eqt Guinea, R East Africa	15186af				
0700-0800 mtwhf	Eqt Guinea, Radio Africa	15186af				
0700-0800	Germany, Deutsche Welle	6140eu				
0700-0800 s	Germany, Good News World	13740as				
0700-0800	Germany, Sunrise Radio	5850eu				
0700-0800	Germany, Voice of Hope	5975eu				
0700-0800	Germany, Overcomer Ministr	13810au				
0700-0800 vl	Ghana, Ghana BC Corp	3366do	4915do			
0700-0800	Guyana, GBC/Voice of	3290al	5950do			
0700-0800 as	Italy, IRRS	7120va				
0700-0800	Kenya, Kenya BC Corp	4885do	4935do			
0700-0800 vl	Lesotho, Radio	4800do				
0700-0715	Liberia, LCN/R Liberia Int	5100do				
0700-0800	Malaysia, Radio	7295do				
0700-0800	Malaysia, RTM Sarawak	7160do				
0700-0800	Malaysia, Voice of	6175as	9750as	15295au		
0700-0800 mtwhf	Monaco, Trans World Radio	6045eu	9870eu			
0700-0715 vl	Namibia, NBC	3270af	3289af			
0700-0705	New Zealand, R NZ Intl	11905pa				
0700-0800 vl	Nigeria, Radio/Ibadan	6050do				
0700-0800 vl	Nigeria, Radio/Kaduna	4770do				
0700-0800 vl	Nigeria, Voice of	7255af	15120va			
0700-0800	Palau, KHBN/Voice of Hope	9965as	9985as	13840as	15725as	
0700-0730 vl	Papua New Guinea, NBC	9675do				
0700-0800	Romania, R Romania Intl	15340af	17745af			
0700-0800	Russia, Voice of Russia WS	17495au	17625au	17665au	21790au	
0700-0800	Sierra Leone, SLBS	3316do				
0700-0800	Singapore, RCorp Singapore	6150do				
0700-0730	Slovakia, R Slovakia Intl	9440au	15460au	17550au		
0700-0800 vl	Solomon Islands, SIBC	5020do				
0700-0730 mtwhf	Swaziland, Trans World R	4775af	6100af	9500af		
0700-0720 a	Swaziland, Trans World R	4775af	6100af	9500af		
0700-0705 s	Swaziland, Trans World R	4775af	6100af	9500af		
0700-0800	Taiwan, Radio Taipei Intl	5950na				
0700-0800	UK, BBC World Service	5975am	6005af	6175am	6190af	
		7145af	7325eu	9410eu	9740as	
		11760me	11765af	11835af	11940af	
		11955pa	12095eu	15310as	15360as	
		15400af	15485eu	15565eu	15575as	
		17640eu	17760as	17790as	17830af	
		21660as				
0700-0715 as	UK, BBC World Service	17885af				
0700-0800	UK, Merlin Network One	6110eu	9915eu	13720as	17630eu	
		21550af				
0700-0800	USA, KAIJ Dallas TX	5810na	9815al			
0700-0800	USA, KTBN Salt Lk City UT	7510na				
0700-0800	USA, KWHR Naalehu HI	11565pa	17780as			
0700-0800	USA, WEWN Birmingham AL	5825va				
0700-0800	USA, WHRA Greenbush ME	11565af				
0700-0800	USA, WHRI Noblesville IN	5745na	7315sa			
0700-0800	USA, WJCR Upton KY	7490na	13595as			
0700-0800	USA, WRNO New Orleans LA	7395na				
0700-0800	USA, WSHB Cypress Crk SC	13650af				
0700-0800	USA, WWCN Nashville TN	2390na	3210na	5070na	5935na	
0700-0745	USA, WYFR Okeechobee FL	7355eu	9985eu	13695va		
0700-0800 vl	Vanuatu, Radio	4960do				
0700-0800	Zambia, Christian Voice	6065af				
0700-0800	Zambia, Natl BC Corp	6165do	6265do			
0700-0800 vl	Zimbabwe, Zimbabwe BC	4828do	5012do			
0705-0710 s	Croatia, Croatian Radio	5945eu	7365eu	9830eu		
0706-0800	New Zealand, R NZ Intl	9700pa				
0715-0800 vl	Namibia, NBC	6060af	6175af			
0725-0800	Myanmar, Radio	9730do				
0730-0800	Austria, R Austria Intl	6155eu	13730eu	15410eu	17870eu	
0730-0800 vl	Papua New Guinea, NBC	4890do				
0730-0735 mtwhf	Swaziland, Trans World R	4775af				
0730-0800	Switzerland, Swiss R Intl	15545af	17685af	21750af		
0740-0750	Greece, Voice of	7475eu	9420eu	11645eu	15630eu	
		17700au				
0740-0800	Guam, TWR/KTWR	15200as				
0800-0900	Anguilla, Caribbean Beacon	6090am				
0800-0830 vl	Australia, ABC/Katherine	5025do				
0800-0830 vl	Australia, ABC/Tent Creek	4910do				
0800-0900	Australia, Radio	9995pa	9710pa	12080va	13605va	
		15510va	21725pa			
0800-0900 vl	Botswana, Radio	4820do	4830do	7255do		
0800-0900 vl	Canada, CBC N Quebec Svc	9625do				
0800-0900	Canada, CFRX Toronto	6070do				
0800-0900	Canada, CFVP Calgary	6030do				
0800-0900	Canada, CHNX Halifax	6130do				
0800-0900	Canada, CKZU Vancouver	6160do				
0800-0900	Costa Rica, RF Peace Intl	6975am				
0800-0805	Croatia, Croatian Radio	13820au				
0800-0900	Ecuador, HCJB	11855eu	15115pa	21455va		
0800-0900 as/vl	Eqt Guinea, R East Africa	15186af				
0800-0900 mtwhf	Eqt Guinea, Radio Africa	15186af				
0800-0900	Germany, Deutsche Welle	6140eu				
0800-0900	Germany, Sunrise Radio	5850eu				
0800-0900	Germany, Voice of Hope	5975eu				
0800-0900	Germany, Overcomer Ministr	13810au				
0800-0900	Guam, TWR/KTWR	15200as	15330as			
0800-0900	Guyana, GBC/Voice of	3290al	5950do			
0800-0900	Indonesia, Voice of	9525va				
0800-0900 as/vl	Italy, IRRS	7120va				
0800-0900	Kenya, Kenya BC Corp	4885do	4935do			
0800-0900 vl	Lesotho, Radio	4800do				
0800-0900	Liberia, LCN/R Liberia Int	5100do				
0800-0900	Malaysia, Radio	7295do				
0800-0830	Malaysia, Voice of	6175as	9750as	15295au		
0800-0900 vl	Malaysia, RTM KotaKinabalu	5980do				
0800-0820 mtwhf	Monaco, Trans World Radio	6045eu	9870eu			
0800-0830	Myanmar, Radio	9730do				
0800-0900	N Marianas, KFBS Saipan	11650as	15380as			
0800-0900 vl	Namibia, NBC	6060af	6175af			
0800-0900	New Zealand, R NZ Intl	9700pa				
0800-0900 vl	Nigeria, Radio/Ibadan	6050do				
0800-0900 vl	Nigeria, Radio/Kaduna	4770do				
0800-0900	Nigeria, Radio/Lagos	3326do				
0800-0820 vl	Pakistan, Radio	15527eu	17835eu			
0800-0900	Palau, KHBN/Voice of Hope	9955as	9985as	13840va	15725as	
0800-0900 vl	Papua New Guinea, NBC	4890do				
0800-0900	Russia, Voice of Russia WS	15490au	17495au	17625au	21790au	
0800-0900 f	Seychelles, FEBA Radio	15540as				
0800-0900	Sierra, Leone, SLBS	5980do				
0800-0900	Singapore, RCorp Singapore	6150do				
0800-0900	South Korea, R Korea Intl	9570au	13670eu			
0800-0900	UK, BBC World Service	6190af	9410eu	9740as	11940af	
		11955pa	12095eu	15310as	15360as	
		15400af	15485eu	15565eu	17640eu	
		17760as	17790as	17830af	21660as	
		15575as	17885af			
0800-0900 as	UK, BBC World Service	9915eu	13660eu	13720as	17630eu	
0800-0900	UK, Merlin Network One	21550af				
0800-0900	USA, KAIJ Dallas TX	5810na	9815al			
0800-0900	USA, KNLS Anchor Point AK	9615as				
0800-0900	USA, KTBN Salt Lk City UT	7510na				
0800-0900	USA, KWHR Naalehu HI	11565pa	17780as			
0800-0900	USA, Voice of America	11775as	13610as	15150as		
0800-0900	USA, WEWN Birmingham AL	5825va				
0800-0900	USA, WHRA Greenbush ME	11565af				
0800-0900	USA, WHRI Noblesville IN	5745na	7315sa			
0800-0900	USA, WJCR Upton KY	7490na	13595as			
0800-0900	USA, WRNO New Orleans LA	7395na				
0800-0900	USA, WSHB Cypress Crk SC	9845pa	9860eu			
0800-0900	USA, WWCN Nashville TN	2390na	3210na	5070na	5935na	
0800-0900 vl	Vanuatu, Radio	4960do				
0800-0900	Zambia, Christian Voice	6065af				
0800-0900	Zambia, Natl BC Corp	6165do	6265do			
0800-0900 vl	Zimbabwe, Zimbabwe BC	4828do	5012do			
0805-0810 mtwhfa	Croatia, Croatian Radio	5945eu	7365eu	9830eu		
0820-0830 t	Kyrgyzstan, Kyrgyz Radio	4010do	4050do			
0820-0850 s	Monaco, Trans World Radio	6045eu	9870eu			
0830-0900 vl	Australia, ABC/Alice Spgs	2310do				
0830-0900 vl	Australia, ABC/Katherine	2485do				
0830-0900 vl	Australia, ABC/Tent Creek	2325do				
0830-0900	Austria, R Austria Intl	21650as	21765as			
0830-0900	Georgia, Georgian Radio	11910eu				
0830-0900 vl	Solomon Islands, SIBC	5020do				
0830-0900	Switzerland, Swiss R Intl	9885as	13685as			
0845-0900 mtwhf	USA, WRMI/R Miami Intl	9955am				



FREQUENCIES

0900-1000	Anguilla,Caribbean Beacon	6090am				1000-1100	Anguilla,Caribbean Beacon	11775am					
0900-1000 vl	Australia, ABC/Alice Spgs	2310do				1000-1030	Armenia, Voice of	4810eu	15270eu				
0900-1000 vl	Australia, ABC/Katherine	2485do				1000-1100 vl	Australia, ABC/Alice Spgs	2310do					
0900-1000 vl	Australia, ABC/Tent Creek	2325do				1000-1100 vl	Australia, ABC/Katherine	2485do					
0900-1000	Australia, Radio	11880as	13605va	17750as	21820as	1000-1100 vl	Australia, ABC/Tent Creek	2325do					
0900-0910 s	Bhutan, Bhutan BC Service	6030do				1000-1100	Australia, Radio	11880as	13605va	17750as	21820as		
0900-1000 vl	Botswana, Radio	4820do	4830do	7255do		1000-1100 vl	Botswana, Radio	4820do	4830do	7255do			
0900-1000	Canada, CFRX Toronto	6070do				1000-1100 vl	Canada, CBC N Quebec Svc	9625do					
0900-1000	Canada, CFVP Calgary	6030do				1000-1100	Canada, CFRX Toronto	6070do					
0900-1000	Canada, CHNX Halifax	6130do				1000-1100	Canada, CFVP Calgary	6030do					
0900-1000	Canada, CKZU Vancouver	6160do				1000-1100	Canada, CHNX Halifax	6130do					
0900-1000	China, China Radio Intl	15210pa	17755pa			1000-1100	Canada, CKZN St John's	6160do					
0900-1000	Costa Rica,RF Peace Intl	6975am				1000-1100	Canada, CKZU Vancouver	6160do					
0900-0929	Czech Rep, R Prague Intl	21745va				1000-1100	China, China Radio Intl	15210pa	17755pa				
0900-1000	Ecuador, HCJB	15115pa	21455va			1000-1100	Costa Rica,RF Peace Intl	6975am					
0900-1000 as/vl	Eqt Guinea, R East Africa	15186af				1000-1100	Ecuador, HCJB	15115pa	21455va				
0900-1000 mtwhf	Eqt Guinea, Radio Africa	15186af				1000-1100 as/vl	Eqt Guinea, R East Africa	15186af					
0900-0945	Germany, Deutsche Welle	6140eu	6160pa	9565af	15210af	1000-1100 mtwhf	Eqt Guinea, Radio Africa	15186af					
		15410af	17560as	17800af	21680as	1000-1100	Germany, Deutsche Welle	6140eu					
		21790af				1000-1100 a	Germany, Good News World	5910eu					
0900-1000	Germany, Sunrise Radio	5850eu				1000-1100	Germany, Sunrise Radio	5850eu					
0900-1000	Germany, Voice of Hope	5975eu				1000-1100	Germany, Voice of Hope	5975eu					
0900-1000	Germany,Overcomer Ministr	13810au				1000-1100 vl	Ghana, Ghana BC Corp	4915do	6130do				
0900-1000 vl	Ghana, Ghana BC Corp	4915do	6130do			1000-1030	Guam, AWR/KSDA	11560as					
0900-0930	Guam, TWR/KTWR	15330as				1000-1100	Guam, TWR/KTWR	9865as					
0900-1000	Guyana, GBC/Voice of	3290af	5950do			1000-1100	Guyana, GBC/Voice of	3290af	5950do				
0900-1000 as/vl	Italy, IRRS	7120va				1000-1100	India, All India Radio	11585as	11735au	13700as	15020as		
0900-1000	Kenya, Kenya BC Corp	4935do						17387au	17840as				
0900-1000 vl	Lesotho, Radio	4800do				1000-1100 as/vl	Italy, IRRS	7120va					
0900-0915	Liberia,LCN/R Liberia Int	5100do				1000-1100	Japan, Radio/NHK	9695as	11850pa	15590as			
0900-1000	Malaysia, Radio	7295do				1000-1100	Jordan, Radio	11690eu					
0900-1000 vl	Malaysia,RTM KotaKinabalu	5980do				1000-1100	Kenya, Kenya BC Corp	4935do					
0900-1000	N Marianas, KFBS Saipan	9495as	11650as	15380as		1000-1010 fa	Kyrgyzstan, Kyrgyz Radio	4010do	4050do				
0900-1000	N Marianas, KHBI Saipan	11660as	15665as			1000-1100 vl	Lesotho, Radio	4800do					
0900-1000 vl	Namibia, NBC	6060af	6175af			1000-1100	Malaysia, Radio	7295do					
0900-1000	New Zealand, R NZ Intl	9700pa				1000-1100 vl	Malaysia,RTM KotaKinabalu	5980do					
0900-1000 vl	Nigeria, Radio/lbadan	6050do				1000-1100	N Marianas, KFBS Saipan	9495as	11650as	15380as			
0900-1000 vl	Nigeria, Radio/Kaduna	4770do				1000-1100	N Marianas, KHBI Saipan	11660as	15665as				
0900-1000	Nigeria, Radio/Lagos	3326do				1000-1100 vl	Namibia, NBC	6060af	6175af				
0900-1000 vl	Pakistan, Radio	15527eu	17835eu			1000-1030	Netherlands, Radio	9820au	12065as	13710as			
0900-1000	Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840va	1000-1015	New Zealand, R NZ Intl	9700pa					
		15725as				1000-1100 vl	Nigeria, Radio/lbadan	6050do					
0900-1000 vl	Papua New Guinea, NBC	4890do				1000-1100 vl	Nigeria, Radio/Kaduna	4770do					
0900-1000	Sierra Leone, SLBS	5980do				1000-1100 vl	Nigeria, Voice of	7255af	15120va				
0900-1000	Singapore,RCorp Singapore	6150do				1000-1100 vl	Pakistan, Radio	15527eu	17835eu				
0900-1000 vl	Solomon Islands, SIBC	5020do				1000-1100	Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840va		
0900-1000	Tanzania, Radio	5050af						15725as					
0900-1000	UK, BBC World Service	6065as	6190af	6195as	9410eu	1000-1100 vl	Papua New Guinea, NBC	4890do					
		9580as	9740as	11760me	11765pa	1000-1100	Philippines, FEBC R Intl	11635as					
		11940af	11945as	11955as	12095eu	1000-1100	Sierra Leone, SLBS	5980do					
		15190as	15310as	15360as	15400af	1000-1030	Singapore, RTE Radio	11740as					
		15485eu	15565eu	15575as	17640eu	1000-1100	Singapore,RCorp Singapore	6150do					
		17705eu	17760as	17790as	17830af	1000-1100 vl	Solomon Islands, SIBC	5020do					
		17885af	21660as			1000-1030	Switzerland, Swiss R Intl	15315eu					
0900-1000	UK, Merlin Network One	9915eu	13660eu	17630eu	21550af	1000-1030	Tanzania, Radio	5050af					
0900-1000	USA, KAIJ Dallas TX	5810na	9815al			1000-1100	UK, BBC World Service	5965am	6190af	6195va	9410eu		
0900-1000	USA, KTVN Salt Lk City UT	7510na					9740as	11760me	11765pa	11940af	12095eu	15310as	
0900-1000	USA, KWHR Naalehu HI	11565pa	17780as				15360as	15485eu	15565eu	15575as	17640eu	17705eu	
0900-1000	USA, Voice of America	11775as	13610as	15150as	15665as		17760as	17790as	17885af	21660as			
0900-1000	USA, WEWN Birmingham AL	5825va				1000-1100 as	UK, BBC World Service	15190as	15400af	17830af			
0900-1000	USA, WHRA Greenbush ME	11565af				1000-1100	UK, Merlin Network One	9915eu	13660eu	17630eu	21550af		
0900-1000	USA, WHRI Noblesville IN	5745na	7315sa			1000-1100	USA, KAIJ Dallas TX	5810na	9815al				
0900-1000	USA, WJCR Upton KY	7490na	13595as			1000-1100	USA, KTVN Salt Lk City UT	7510na					
0900-1000	USA, WRNO New Orleans LA	7395na				1000-1100	USA, KWHR Naalehu HI	9930as	11565pa	17780as			
0900-1000	USA, WSHB Cypress Crk SC	9455sa	9860eu			1000-1100	USA, Voice of America	6165ca	7405ca	9590ca	9770pa		
0900-1000	USA, WWCR Nashville TN	2390na	3210na	5070na	5935na		11660as	11720as	15240as	15425as	15665as		
0900-1000	Zambia, Christian Voice	6065af				1000-1100	USA, WEWN Birmingham AL	7425na	15745eu				
0900-1000	Zambia, Natl BC Corp	6165do	6265do			1000-1100	USA, WHRI Noblesville IN	6040na	9495am				
0900-1000 vl	Zimbabwe, Zimbabwe BC	4828do	5012do			1000-1100	USA, WJCR Upton KY	7490na	13595as				
0905-0910 s	Croatia, Croatian Radio	7365eu	9830eu	13830eu		1000-1100	USA, WRNO New Orleans LA	7395na					
0930-1000	Canada, CKZN St John's	6160do				1000-1100	USA, WSHB Cypress Crk SC	6095am	9455sa				
0930-1000	Georgia, Georgian Radio	11910eu				1000-1100	USA, WWCR Nashville TN	2390na	5070na	5935na	12160na		
0930-1000	Guam, TWR/KTWR	9865as				1000-1100	USA, WYFR Okeechobee FL	5950na					
0930-1000	Italy, AWR Europe	7230eu				1000-1025	Vietnam, Voice of	5940as	7270as	7400as	9840as		
0930-1000	Lithuania, Radio Vilnius	9710eu						12019as	15110as				
0930-1000	Netherlands, Radio	9820au	12065as	13710as		1000-1100	Zambia, Christian Voice	6065af					
0930-1000	Philippines, FEBC R Intl	11635as				1000-1100	Zambia, Natl BC Corp	6165do	6265do				
0945-1000	Germany, Deutsche Welle	6140eu				1000-1100 vl	Zimbabwe, Zimbabwe BC	4828do	5012do				
0950-0945 a	UK, BBC World Service	6095as	9580as	11945as	11955as	1015-1030 mtwhfa	Vatican City, Vatican R	5883eu	9645eu	11740eu	15595eu		
		15280as						21850va					
						1030-1057	Czech Rep, R Prague Intl	9880eu	11615eu				
						1030-1100	Ethiopia, Radio	5990do	7110do	9705do			
						1030-1100	Guam, AWR/KSDA	11560as	11795as				
						1030-1035	Israel, Kol Israel	15650va	17535va				
						1030-1100	Malaysia, RTM Sarawak	7160do					
						1030-1100	Netherlands, Radio	6045eu	9820as	9860eu	12065as	13710as	
						1030-1100	South Korea, R Korea Intl	11715na					
						1030-1100 as	Tanzania, Radio	5050af					
						1030-1100	UAE, Radio Dubai	13675eu	15370eu	15395eu	21605eu		



SELECTED PROGRAMS

1100 BBC (AE/AF/AS): Newsdesk. See S 1100.
1130 BBC (AE): People and Politics. See A 0030.
1130 BBC (AF): Variable Feature. See S 0601.
1130 BBC (AS): My Century. See M 0030.

1100 BBC (AE): Newsdesk. See S 1100.



SELECTED PROGRAMS

Sundays

1300	BBC (AE/AF/AS): Newshour. A comprehensive look at the major topics of the day, plus up-to-the-minute international and British news.
1300	Canada, RCI Montreal: World Report. Ten minutes of CBC News.
1311	Canada, RCI Montreal: This Morning (hour 1). David Enright and Avril Benoit co-host the Sunday Edition of this CBC magazine program (hour 1 of 3 hours).
1330	Canada, RCI Montreal: RCI News. See S 0100.
1330	Sweden, Radio: In Touch with Stockholm (1). A mailbag program with on-the-air link-ups presented by Nidia Hagastrom.
1330	Sweden, Radio: Sounds Nordic (2/4). The very latest and best in Swedish rock and pop music, interviews with the stars, and what's happening on the youth scene.
1330	Sweden, Radio: Weekend (3). Jointly produced by Sweden, BBC, Deutsche Welle, France and Netherlands to encompass a broad range of interests.
1336	Canada, RCI Montreal: The Mailbag. A program entirely devoted to listeners' letters in which host Marc Montgomery answers questions and reads comments on programs and impressions of Canada.

Mondays

1300	BBC (AE/AF/AS): Newshour. See S 1300.
1300	Canada, RCI Montreal: CBC Radio News. See S 0200.
1306	Canada, RCI Montreal: This Morning. David Enright and Avril Benoit co-host this CBC magazine program.
1330	Canada, RCI Montreal: RCI News. See S 0100.
1330	Sweden, RCI: Sixty Degrees North. Reports.

interviews and analysis from Stockholm and other Nordic capitals.

1340 Canada, RCI Montreal: Spectrum. A weekday magazine program of current affairs, features, and a business report presented by Jim Craig.

1347 Sweden, Radio: SportScan. A weekly magazine of Swedish and Scandinavian sports hosted by Kris Boswell.

Tuesdays

1300 BBC (AE/AF/AS): Newshour. See S 1300.
1300 Canada, RCI Montreal: CBC Radio News. See S 0200.
1306 Canada, RCI Montreal: This Morning. See M 1306.
1330 Canada, RCI Montreal: RCI News. See S 0100.
1330 Sweden, Radio: Sixty Degrees North. See M 1330.
1340 Canada, RCI Montreal: Spectrum. See M 1340.
1346 Sweden, Radio: MediaScan (1/3). George Wood hosts the successor program to Sweden Calling DXers. Now mostly about satellite and internet broadcasting.

Wednesdays

1300 BBC (AE/AF/AS): Newshour. See S 1300.
1300 Canada, RCI Montreal: CBC Radio News. See S 0200.
1306 Canada, RCI Montreal: This Morning. See M 1306.
1330 Canada, RCI Montreal: RCI News. See S 0100.
1330 Sweden, Radio: Sixty Degrees North. See M 1330.
1340 Canada, RCI Montreal: Spectrum. See M 1340.

Thursdays

1300 BBC (AE/AF/AS): Newshour. See S 1300.
1300 Canada, RCI Montreal: CBC Radio News. See S 0200.
1306 Canada, RCI Montreal: This Morning. See M 1306.
1330 Canada, RCI Montreal: RCI News. See S 0100.
1330 Sweden, Radio: Sixty Degrees North. See M 1330.
1340 Canada, RCI Montreal: Spectrum. See M 1340.
1346 Sweden, Radio: GreenScan (2). Azariah Kipra covers

other		environmental concerns and solutions.
any	1346	Sweden, Radio: HeartBeat (3). Gaby Katz takes you into Swedish laboratories to find out about the latest discoveries and breakthroughs.
es, and a		
	1346	Sweden, Radio: Horizon (4/5). George Wood hosts this science and technology magazine.
ine of		
Kris	1346	Sweden, Radio: Nordic Report (1). A coproduction between Radio Sweden, Radio Finland and Radio Norway.

Fridays

1300 BBC (AE/AF/AS): Newshour. See S 1300.
1300 Canada, RCI Montreal: CBC Radio News. See S 0200.
1306 Canada, RCI Montreal: This Morning. See M 1306.
1330 Canada, RCI Montreal: RCI News. See S 0100.
1330 Sweden, Radio: Sixty Degrees North. See M 1330.
1335 Sweden, Radio: Review of the Nordic Newsweek.
George Wood and Gaby Katz present the major stories of the week, both from Sweden and their Nordic neighbors.
1340 Canada, RCI Montreal: Spectrum. See M 1340.

Saturdays

1300	BBC (AE/AF/AS): Newshour. See S 1300.
1330	Canada, RCI Montreal: RCI News. See S 0100.
1330	Sweden, Radio: Special Feature (4). These special features occur on the fourth week of the month and run for 30 minutes.
1330	Sweden, Radio: Spectrum (1/3). Bill Schiller with the latest on Swedish music, drama, art, and film.
1330	Sweden, Radio: Sweden Today (2). George Wood presents voices from a wide range of people in the Scandinavian nation.
1337	Canada, RCI Montreal: Venture Canada. See S 0107.

FREQUENCIES

1500-1600	Anguilla, Caribbean Beacon	11775am				1500-1600	Philippines, FEBC R Intl	11995as			
1500-1600 vl	Australia, ABC/Alice Spgs	2310do				1500-1600 vl	Russia, Voice of Assyria	6005me	9480me		
1500-1600 vl	Australia, ABC/Katherine	2485do				1500-1600	Russia, Voice of Russia WS	4730me	4940me	4975me	7325me
1500-1600 vl	Australia, ABC/Tent Creek	2325do						9730eu	11500as	12070me	15545eu
1500-1600	Australia, Radio	5995as	6180va	9500as	9580va	1500-1530	S Africa, Channel Africa	17870af			
		11650va	11660as	17750pa		1500-1600 mtwhfa	Seychelles, FEBA Radio	9810as	11600as		
1500-1600 vl	Botswana, Radio	4820do	4830do	7255do		1500-1600	Sierra Leone, SLBS	5980do			
1500-1600 vl	Canada, CBC N Quebec Svc	9625do				1500-1600	Singapore, RCorp Singapore	6150do			
1500-1600	Canada, CFRX Toronto	6070do				1500-1600	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as	
1500-1600	Canada, CFVP Calgary	6030do				1500-1600 as	Tanzania, Radio	5050af			
1500-1600	Canada, CHNX Halifax	6130do				1500-1600	Uganda, Radio	4976do			
1500-1600	Canada, CKZN St John's	6160do				1500-1600	UK, BBC World Service	5975as	5990as	6190af	6195as
1500-1600	Canada, CKZU Vancouver	6160do						9410eu	9515am	9740as	11860af
1500-1600 s	Canada, R Canada Intl	13650na	17800na					11940af	12095eu	15220am	15310as
1500-1600	China, China Radio Intl	7160as	9785as	13685af	15125af			15400af	15420af	15485eu	15575eu
1500-1600	Costa Rica, RF Peace Intl	15050am	21460am					17705va	17830af	17840am	21470af
1500-1600	Ecuador, HCJB	12005ca	15115am	21455va				21490af	21660af		
1500-1600 as/vl	Eq Guinea, R East Africa	15186af				1500-1600	UK, Merlin Network One	9915eu	13645eu	21550af	
1500-1600	Germany, Sunrise Radio	5850eu				1500-1600	USA, KAIJ Dallas TX	13815na	15725af		
1500-1530	Germany, Voice of Hope	15715as				1500-1600	USA, KJES Vado NM	11715na			
1500-1600 vl	Ghana, Ghana BC Corp	4915do	6130do			1500-1600	USA, KTNB Salt Lk City UT	15590na			
1500-1600	Guyana, GBC/Voice of	3290af	5950do			1500-1600	USA, KWHR Naalehu HI	9930as	11565pa		
1500-1600	Japan, Radio/NHK	7200as	9505na	9750as	11730as	1500-1600	USA, Voice of America	7125as	7215as	9645as	9700me
1500-1600	Jordan, Radio	11690eu						15205va	15255va	15395as	
1500-1600	Kenya, Kenya BC Corp	4935do				1500-1600	USA, WEWN Birmingham AL	9455na	11875na	15745eu	
1500-1600 vl	Lesotho, Radio	4800do				1500-1600	USA, WGTG McCaysville GA	9400am			
1500-1510	Liberia, LCN/R Liberia Int	5100do				1500-1600	USA, WHRI Noblesville IN	6040af	13760na	15105sa	
1500-1600	Malaysia, Radio	7295do				1500-1600	USA, WJCR Upton KY	7490na	13595as		
1500-1600	Malaysia, RTM Sarawak	7160do				1500-1600 irreg	USA, WMLK Bethel PA	9465am			
1500-1600 vl	Malaysia, RTM KotaKinabalu	5980do				1500-1600	USA, WRNO New Orleans LA	7395na	15420af		
1500-1530	Mexico, Radio Mexico Intl	5985al	9705am			1500-1600	USA, WWCN Nashville TN	9475na	12160na	13845na	15685na
1500-1530	Mongolia, Voice of	9720as	12015as			1500-1600	USA, WYFR Okeechobee FL	11830na	17750na		
1500-1600	Myanmar, Radio	5986do				1500-1510	Vatican City, Vatican R	12065om	13795au	15500au	
1500-1600	N Marianas, KFBS Saipan	9465as	9495as	9670as		1500-1600	Zambia, Christian Voice	6065af			
1500-1600 vl	Namibia, NBC	6060af	6175af			1500-1600	Zambia, Natl BC Corp	6165do	6265do		
1500-1600	Netherlands, Radio	9890as	12075as	15590as		1500-1600 vl	Zimbabwe, Zimbabwe BC	4828do	5012do		
1500-1600 occsnal	New Zealand, R NZ Intl	6100pa				1530-1540	Bangladesh, Bangla Betar	4880as	15520as		
1500-1600 vl	Nigeria, Radio/Ibadan	6050do				1530-1600	Guam, AWR/KSDA	11930as			
1500-1600 vl	Nigeria, Radio/Kaduna	4770do				1530-1600	Iran, VOIRI	9780as	11775as	13605as	
1500-1600 vl	Nigeria, Voice of	7255af	15120va			1530-1545 s	Seychelles, FEBA Radio	11600as			
1500-1600	North Korea, R Pyongyang	3560as	9640va	9975me	11335am	1530-1600	Tanzania, Radio	5050af			
		11735am	13650va			1545-1600 sh	Bangladesh, Bangla Betar	4880as	15520as		
		9955as	9965as	9985as	15725as	1545-1600 m	Guam, TWR/KTWR	15330as			
1500-1600 vl	Palau, KHBN/Voice of Hope	4890do				1550-1600 a	Vatican City, Vatican R	12065om	13765au	15500au	
1500-1600 vl	Papua New Guinea, NBC										

SELECTED PROGRAMS

Sundays

1500	BBC (AE/AF/AS): World News. See S 0000.	1530	BBC (AE): Composer of the Month. In depth looks at classical composers and their music. A different composer is featured each month.
1500	Canada, RCI Montreal: RCI News. See S 0100.	1530	BBC (AF): The Learning Zone. See S 1530.
1501	BBC (AS): Play of the Week (SAs). A different radio drama program each week (alternative programming for South Asia).	1530	BBC (AS): Meridian Feature. See M 0130.
1505	BBC (AE/AF): Sports Roundup. See S 0320.		
1505	BBC (AS): From Our Own Correspondent. See S 0005.		
1506	Canada, RCI Montreal: This Morning (hour 3). David Enright and Avril Benoit co-host the Sunday Edition of this CBC magazine program (hour 3 of 3 hours).		
1515	BBC (AE): Concert Hall. Classical music concerts.		
1515	BBC (AF): Concert Hall. See S 1515.		
1530	BBC (AF): The Learning Zone. For people who want to learn more about subjects such as science, health, the world and work and literature while practicing English listening skills.		
1530	BBC (AS): Global Business. See S 0130.		

Mondays

1500	BBC (AE/AF): World News. See S 0000.
1500	BBC (AS): East Asia Today (EAs). News, analysis, press reviews and reports from BBC correspondents.
1500	BBC (AS): World News. See S 0000.
1505	BBC (AE): Sports Roundup. See S 0320.
1505	BBC (AF): Focus on Africa. Up-to-the-minute reports on the day's events from all over the continent.
1505	BBC (AS): Sports Roundup. See S 0320.
1515	BBC (AE): Science Extra. See S 0030.
1515	BBC (AS): Variable Feature. See S 0601.

Tuesdays

1500	BBC (AE/AF): World News. See S 0000.
1500	BBC (AS): East Asia Today (EAs). See M 1500.
1500	BBC (AS): World News. See S 0000.
1505	BBC (AE): Sports Roundup. See S 0320.
1505	BBC (AF): Focus on Africa. See M 1505.
1505	BBC (AS): Sports Roundup. See S 0320.
1515	BBC (AE): Westway. See T 0130.
1515	BBC (AS): Variable Feature. See S 0601.
1530	BBC (AE): Everywoman. See S 1130.
1530	BBC (AF): The Learning Zone. See S 1530.
1530	BBC (AS): Insight (EAs). See M 1645.
1530	BBC (AS): On Screen. See T 0430.
1555	BBC (AS): Off the Shelf (EAs). See M 0145.

Wednesdays

1500	BBC (AE/AF): World News. See S 0000.
1500	BBC (AS): East Asia Today (EAs). See M 1500.
1500	BBC (AS): World News. See S 0000.
1505	BBC (AE): Sports Roundup. See S 0320.
1505	BBC (AF): Focus on Africa. See M 1505.
1505	BBC (AS): Sports Roundup. See S 0320.
1515	BBC (AE): From Our Own Correspondent. See S 0005.
1515	BBC (AS): Record News. See M 0415.
1530	BBC (AE): Jazzmatazz. See M 0530.
1530	BBC (AF): The Learning Zone. See S 1530.
1530	BBC (AS): Insight (EAs). See M 1645.
1530	BBC (AS): Meridian Live. See W 0430.
1545	BBC (AS): Off the Shelf (EAs). See M 0145.

Thursdays

1500	BBC (AE/AF): World News. See S 0000.
1500	BBC (AS): East Asia Today (EAs). See M 1500.
1500	BBC (AS): World News. See S 0000.
1505	BBC (AE): Sports Roundup. See S 0320.
1505	BBC (AF): Focus on Africa. See M 1505.
1505	BBC (AS): Sports Roundup. See S 0320.
1515	BBC (AE): Westway. See T 0130.
1515	BBC (AS): From Our Own Correspondent. See S 0005.
1530	BBC (AE): The Greenfield Collection. See S 0430.
1530	BBC (AF): The Learning Zone. See S 1530.
1530	BBC (AS): Insight (EAs). See M 1645.
1530	BBC (AE): Meridian Books. See H 0430.
1545	BBC (AS): Off the Shelf (EAs). See M 0145.

Fridays

1500	BBC (AE/AF): World News. See S 0000.
1500	BBC (AS): East Asia Today (EAs). See M 1500.
1500	BBC (AS): World News. See S 0000.
1505	BBC (AE): Football Extra. A review of the week's action and the upcoming weekend matches.
1505	BBC (AF): Focus on Africa. See M 1505.
1505	BBC (AS): Football Extra. See F 1505.
1515	BBC (AE/AS): Variable Feature. See S 0601.
1530	BBC (AE): The Vintage Chart Show. See M 0530.
1530	BBC (AF): The Learning Zone. See S 1530.
1530	BBC (AS): Insight (EAs). See M 1645.
1530	BBC (AS): Meridian Books. See S 0130.
1555	BBC (AS): Off the Shelf (EAs). See M 0145.

Saturdays

1500	BBC (AE/AF/AS): World News. See S 0000.
1505	BBC (AE/AF/AS): Sportsworld. See A 1405.

FREQUENCIES

1600-1700	Algeria, R Algiers Intl	6160af	11715af	15160me	1600-1700	Swaziland, Trans World R	9500af		
1600-1700	Anguilla, Caribbean Beacon	11775am			1600-1615	Switzerland, Swiss R Intl	9575as	17670as	
1600-1700 vl	Australia, ABC/Alice Spgs	2310do			1600-1700	Tanzania, Radio	5050af		
1600-1700 vl	Australia, ABC/Katherine	2485do			1600-1645	UAE, Radio Dubai	13630eu	13675eu	15395eu 21605eu
1600-1700 vl	Australia, ABC/Tent Creek	2325do			1600-1700	Uganda, Radio	4976do		
1600-1700	Australia, Radio	5995as	6180va	9500as 9580va	1600-1700	UK, BBC World Service	3915as	5975as	5990as 6190af
		11650va	11660as	17750pa			6195as	7160as	9410eu 9515am
1600-1700 vl	Botswana, Radio	4820do	4830do	7255do			9740as	11940af	12095eu 15310as
1600-1700 vl	Canada, CBC N Quebec Svc	9625do					15400af	15485eu	15575eu 17705as
1600-1700	Canada, CFRX Toronto	6070do					17830af	17840am	21470af 21660af
1600-1700	Canada, CFVP Calgary	6030do			1600-1700	UK, Merlin Network One	6175eu	21550af	
1600-1700	Canada, CHNX Halifax	6130do			1600-1700	USA, KAIJ Dallas TX	13815na	15725al	
1600-1700	Canada, CKZN St John's	6160do			1600-1700	USA, KTVN Salt Lk City UT	15590na		
1600-1700	Canada, CKZU Vancouver	6160do			1600-1700	USA, KWHR Naalehu HI	9930as	11565pa	
1600-1700	China, China Radio Intl	7190af	9565af		1600-1700	USA, Voice of America	6035af	6110as	6160as 7125as
1600-1700	Costa Rica, RF Peace Intl	15050am	21460am				7215as	9645as	9700as 9760as
1600-1627	Czech Rep, R Prague Intl	5830eu	21745af				13710af	15205va	15225af 15255va
1600-1630	Ecuador, HCJB	12005am	15115am	21455am			15395as	15410af	
1600-1700	Ethiopia, Radio	7165af	9560af		1600-1700	USA, WEWN Birmingham AL	11875na	13615na	15745eu
1600-1654	France, Radio France Intl	11615af	11995af	12015af 15210af	1600-1700	USA, WGTG McCaysville GA	9400am		
		17605af	17850af		1600-1700	USA, WHRA Greenbush ME	17650af		
		6140eu	6170as	7225as 9735af	1600-1700	USA, WHRI Noblesville IN	13760na	15105sa	
		9875as	11810af	15135af 17595as	1600-1700	USA, WJCR Upton KY	7490na	13595as	
		21695af			1600-1700 irreg	USA, WMLK Bethel PA	9465am		
1600-1700 s	Germany, Good News World	6155va			1600-1700	USA, WRNO New Orleans LA	7395na	15420al	
1600-1700	Germany, Sunrise Radio	5850eu			1600-1700	USA, WSHB Cypress Crk SC	18910af		
1600-1700	Germany, Overcomer Ministr	13810me			1600-1700	USA, WWCR Nashville TN	9475na	12160na	13845na 15685na
1600-1700 vl	Ghana, Ghana BC Corp	4915do	6130do		1600-1700	USA, WYFR Okeechobee FL	11830na	15600na	15695eu 17555eu
1600-1700	Guam, AWR/KSDA	11750as					17750na	21525af	
1600-1630 as	Guam, TWR/KTWR	15330as			1600-1615 a	Vatican City, Vatican R	12065om	13765au	15500au
1600-1700	Guyana, GBC/Voice of	3290al	5950do		1600-1625	Vietnam, Voice of	5940eu	7270eu	7400eu 9840af
1600-1630	Iran, VOIRI	9780as	11775as	13605as			12019eu		
1600-1630	Jordan, Radio	11690eu			1600-1700	Zambia, Christian Voice	3330af	4965af	
1600-1700	Kenya, Kenya BC Corp	4935do			1600-1700	Zambia, Natl BC Corp	6165do	6265do	
1600-1700	Lebanon, Voice of Hope	9960me			1600-1630 vl	Zimbabwe, Zimbabwe BC	4828do	5012do	
1600-1700 vl	Lesotho, Radio	4800do			1615-1645 a	UK, BBC World Service	11860af		
1600-1700	Malaysia, Radio	7295do			1615-1700 a	UK, BBC World Service	9515am		
1600-1700	N Marianas, KFBS Saipan	9465as	9495as		1615-1630	Vatican City, Vatican R	4005eu	5883eu	7250eu 9645eu
1600-1700 vl	Namibia, NBC	6060af	6175af				15595eu		
1600-1625	Netherlands, Radio	9890as	12075as	15590as	1630-1700	Austria, R Austria Intl	6155va	13730va	15240va 17560va
1600-1650 occsnal	New Zealand, R NZ Intl	6100pa			1630-1700	Canada, R Canada Intl	6140as	7150as	
1600-1700 vl	Nigeria, Radio/Ibadan	6050do			1630-1700 s	Canada, R Canada Intl	9640na	13650na	17715na
1600-1700 vl	Nigeria, Radio/Kaduna	4770do			1630-1700	Egypt, Radio Cairo	15255af		
1600-1700	Nigeria, Voice of	7255af	15120va		1630-1700 mtwhf	Eqt Guinea, Radio Africa	7190af	15186af	
1600-1630	Pakistan, Radio	11570me	15170af	15325eu 15462me	1630-1700	Georgia, Georgian Radio	6180me		
		17720af			1630-1700 s	Seychelles, FEBA Radio	11665as		
1600-1700	Palau, KHBN/Voice of Hope	9955as	9965as		1630-1700	Slovakia, R Slovakia Intl	5920eu	6055eu	7345eu
1600-1700 vl	Papua New Guinea, NBC	4890do			1630-1700 vl	Zimbabwe, Zimbabwe BC	3306do	4828do	
1600-1700	Russia, Voice of Russia WS	9730eu	12070me	15490me 15550as	1645-1700	Germany, Deutsche Welle	6140eu		
1600-1630	S Africa, Channel Africa	6150af			1645-1700	Tajikistan, Radio	7245as		
1600-1700	Sierra Leone, SLBS	5980do			1645-1700 smwf	UK, BBC World Service	11860af		
1600-1700	South Korea, R Korea Intl	5975om	9515af	9870af	1650-1700 mtwhf	New Zealand, R NZ Intl	6145pa		

SELECTED PROGRAMS

Sundays

- 1600 BBC (AE/AF/AS): World News. See S 0000.
- 1600 Guam, TWR/KTWR: Unshackled.
- 1605 BBC (AE/AF/AS): Sunday Sportsworld. The Sunday sports magazine.

Mondays

- 1600 BBC (AE): Europe Today. All the latest news, analysis and comment.
- 1600 BBC (AF/AS): World News. See S 0000.
- 1615 BBC (AF): Fast Track. The latest African sports news and action.
- 1615 BBC (AS): The UK Top Twenty. Tim Smith presents the UK's pop countdown.
- 1630 BBC (AE): World Business Report. See M 1205.
- 1645 BBC (AE/AF): Insight. An examination of a topical aspect of the international scene.
- 1645 BBC (AS): World Business Report. See M 1205.

Tuesdays

- 1600 BBC (AE): Europe Today. See M 1600.
- 1600 BBC (AF/AS): World News. See S 0000.
- 1615 BBC (AF): African Perspective. A considered view of life and issues facing the African continent.
- 1615 BBC (AS): John Peel. See T 0230.
- 1630 BBC (AE): World Business Report. See M 1205.

- 1645 BBC (AE/AF): Insight. See M 1645.
- 1645 BBC (AS): World Business Report. See M 1205.

Wednesdays

- 1600 BBC (AE): Europe Today. See M 1600.
- 1600 BBC (AF/AS): World News. See S 0000.
- 1615 BBC (AF): Talkabout Africa. Telephone conversations with BBC correspondents on late-breaking African events.
- 1615 BBC (AS): Blues World. See M 0230.
- 1630 BBC (AE): World Business Report. See M 1205.
- 1645 BBC (AE/AF): Insight. See M 1645.
- 1645 BBC (AS): World Business Report. See M 1205.

Thursdays

- 1600 BBC (AE): Europe Today. See M 1600.
- 1600 BBC (AF/AS): World News. See S 0000.
- 1615 BBC (AF): Art Beat. See S 0430.
- 1615 BBC (AS): The Vintage Chart Show. See M 0530.
- 1630 BBC (AE): World Business Report. See M 1205.
- 1645 BBC (AE/AF): Insight. See M 1645.
- 1645 BBC (AS): World Business Report. See M 1205.

Fridays

- 1600 BBC (AE): Europe Today. See M 1600.
- 1600 BBC (AF/AS): World News. See S 0000.

- 1615 BBC (AF): Fast Track. See M 1615.
- 1615 BBC (AS): Andy Kershaw's World of Music. See W 0530.
- 1630 BBC (AE): World Business Report. See M 1205.
- 1645 BBC (AE/AF): Insight. See M 1645.
- 1645 BBC (AS): World Business Report. See M 1205.

Saturdays

- 1600 BBC (AE/AF/AS): World News. See S 0000.
- 1600 Guam, TWR/KTWR: Powerhouse.
- 1605 BBC (AE/AF/AS): Sportsworld. See A 1405.

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FREQUENCIES

1700-1800	Afghanistan, VO Shari' ah	7075do				1800-1900	Anguilla,Caribbean Beacon	11775am			
1700-1800	Anguilla,Caribbean Beacon	11775am				1800-1900 mtwhf	Argentina, RAE	15345eu			
1700-1800 vl	Australia, ABC/Alice Spgs	2310do				1800-1900 vl	Australia, ABC/Alice Spgs	2310do			
1700-1800 vl	Australia, ABC/Katherine	2485do				1800-1900 vl	Australia, ABC/Katherine	2485do			
1700-1800 vl	Australia, ABC/Tent Creek	2325do				1800-1900 vl	Australia, ABC/Tent Creek	2325do			
1700-1800	Australia, Radio	595as	6180va	9500as	9580va	1800-1900	Australia, Radio	6080pa	7240va	9500as	9580va
		9660va	11880va					9660va			
1700-1730	Azerbaijan, R Dada Gorgud	9165me				1800-1900	Bangladesh, Bangla Betar	7185eu	7462eu	9548eu	15520eu
1700-1800 vl	Botswana, Radio	4820do	4830do	7255do		1800-1900 vl	Botswana, Radio	4820do	4830do		
1700-1800 vl	Canada, CBC N Quebec Svc	9625do				1800-1900	Brazil, R Nacional Bras	15265eu			
1700-1800	Canada, CFRX Toronto	6070do				1800-1900	Canada, CFRX Toronto	6070do			
1700-1800	Canada, CFVP Calgary	6030do				1800-1900	Canada, CFVP Calgary	6030do			
1700-1800	Canada, CHNX Halifax	6130do				1800-1900	Canada, CHNX Halifax	6130do			
1700-1800	Canada, CKZN St John's	6160do				1800-1900	Canada, CKZN St John's	6160do			
1700-1800	Canada, CKZU Vancouver	6160do				1800-1900	Canada, CKZU Vancouver	6160do			
1700-1800	China, China Radio Intl	7150af	7405af	9570af	9745af	1800-1900	Costa Rica,RF Peace Intl	15050am	21460am		
1700-1800	Costa Rica,RF Peace Intl	15050am	21460am			1800-1830	Egypt, Radio Cairo	15255af			
1700-1727	Czech Rep, R Prague Intl	5930eu	21745af			1800-1900 mtwhf	Eqt Guinea, Radio Africa	7190af	15186af		
1700-1800	Egypt, Radio Cairo	15255af				1800-1900	Germany, Deutsche Welle	6140eu			
1700-1800 mtwhf	Eqt Guinea, Radio Africa	7190af	15186af			1800-1900	Germany, Sunrise Radio	5850eu			
1700-1730	France, Radio France Intl	15210af	17605af			1800-1830 s	Germany, Universal Life	11605eu			
1700-1800	Germany, Deutsche Welle	6140eu				1800-1900	Germany,Overcomer Ministr	3965eu			
1700-1800 a	Germany, Good News World	11725va				1800-1900 vl	Ghana, Ghana BC Corp	3366do	4915do		
1700-1800	Germany, Sunrise Radio	5850eu				1800-1815	Greece, Voice of	7450eu	9425eu	17705na	17765sa
1700-1730 a	Germany, Universal Life	11745af				1800-1900	Guyana, GBC/Voice of	3290af	5950do		
1700-1730	Germany,Overcomer Ministr	3965eu				1800-1900	India, All India Radio	7410eu	9635af	9950eu	11620eu
1700-1800 vl	Ghana, Ghana BC Corp	3366do	4915do					11935af	15075af	15200af	
1700-1800	Guyana, GBC/Voice of	3290af	5950do			1800-1900 vl	Italy, IRRS	3985va			
1700-1800 vl	Italy, IRRS	3985va				1800-1900	Kenya, Kenya BC Corp	4935do			
1700-1800	Japan, Radio/NHK	7110eu	9535na	15355af		1800-1900	Kuwait, Radio	11990am			
1700-1800	Kenya, Kenya BC Corp	4935do				1800-1900	Lebanon, Voice of Hope	9960me			
1700-1800	Lebanon, Voice of Hope	9960me				1800-1900 vl	Lesotho, Radio	4800do			
1700-1800 vl	Lesotho, Radio	4800do				1800-1815	Liberia,LCN/R Liberia Int	5100do			
1700-1800	Malaysia, Radio	7295do				1800-1900	Malaysia, Radio	7295do			
1700-1800	N Marianas, KFBS Saipan	9465as				1800-1900	N Marianas, KFBS Saipan	9465as			
1700-1800	N Marianas, KFBS Saipan	9465as				1800-1900	N Marianas, KHBI Saipan	13820as			
1700-1800 mtwhf	New Zealand, R NZ Intl	6145pa				1800-1830	Netherlands, Radio	6020af	7120af	11655af	
1700-1800 vl	Nigeria, Radio/Ibadan	6070do				1800-1850 mtwhf	New Zealand, R NZ Intl	6145pa			
1700-1800 vl	Nigeria, Radio/Kaduna	4770do				1800-1900 vl	Nigeria, Radio/Ibadan	6050do			
1700-1800	Nigeria, Radio/Lagos	3326do				1800-1900 vl	Nigeria, Radio/Kaduna	4770do			
1700-1800	Palau, KHBN/Voice of Hope	9955as	9965as			1800-1900	Nigeria, Radio/Lagos	3326do			
1700-1800 vl	Papua New Guinea, NBC	4890do				1800-1900 vl	Nigeria, Voice of	7255af	15120va		
1700-1755	Poland, Polish R Warsaw	6095eu	7285eu			1800-1900	North Korea, R Pyongyang	4405as	6575eu	9335eu	11710am
1700-1800	Romania, R Romania Int	15380eu	15720eu	17735eu	17865eu	1800-1900	Palau, KHBN/Voice of Hope	9965as			
1700-1800	Russia,Voice of Russia WS	9720eu	9775eu	11510af	12065af	1800-1900 vl	Papua New Guinea, NBC	4890do			
		15545eu	15735eu			1800-1900	Philippines, R Pilipinas	11720as	11890as	15190as	
1700-1800 smwhfa	Russia,Voice of Russia WS	9820eu	11675eu			1800-1900	Russia,Voice of Russia WS	7310eu	9640af	9720eu	9775eu
1700-1730	S Africa, Channel Africa	17860af				1800-1900		9820eu	9865eu	11510af	11675eu
1700-1800	Sierra Leone, SLBS	5980do				1800-1900		12025af	12065af	15545eu	15735eu
1700-1800	Tanzania, Radio	5050do				1800-1830	S Africa, AWR Africa	5960af	6100af		
1700-1800	Uganda, Radio	4976do				1800-1830	S Africa, Channel Africa	17870af			
1700-1800	UK, BBC World Service	3255af	3915as	5975as	6005af	1800-1900 vl	Sierra Leone, SLBS	3316do			
		6190af	7160as	9410eu	9510as	1800-1830	Solomon Islands, SIBC	5020do			
		9740as	11995me	12095eu	15400af	1800-1900	Swaziland, Trans World R	9500af			
		15485eu	15575eu	17830af	17840am	1800-1900	Swaziland, Trans World R	3200af			
1700-1800	UK, Merlin Network One	6175eu	21550af			1800-1900	Tanzania, Radio	5050af			
1700-1800	USA, KAIJ Dallas TX	13815na	15725al			1800-1900	UK, BBC World Service	3255af	5975as	6005as	6180eu
1700-1800	USA, KTVN Salt Lk City UT	15590na				1800-1900		9410eu	9510as	9740pa	11995me
1700-1800	USA, KWHR Naalehu HI	9930as				1800-1900		12095eu	15400af	15420af	17840am
1700-1800	USA, Voice of America	6110as	6190as	7125as	7170as	1800-1900	UK, Merlin Network One	6175eu	15575eu	17830af	17840am
		9645as	9700me	9760af	15255va	1800-1900	USA, KAIJ Dallas TX	13815na	15575eu	17830af	17840am
		15395as	15410af	15445af	17895af	1800-1900	USA, KJES Vado NM	15385au	15725af		
1700-1800 mtwhf	USA, Voice of America	5990as	6045as	7150as	9550as	1800-1900	USA, KTVN Salt Lk City UT	15590na			
		9770as	11870as			1800-1900	USA, KWHR Naalehu HI	17510as			
1700-1800	USA, WEWN Birmingham AL	11875na	13615na	15745eu		1800-1900	USA, Voice of America	6035af	7415af	9760af	9770me
1700-1800	USA, WGTG McCaysville GA	9400am				1800-1900		11975af	13820as	15410af	17895af
1700-1800	USA, WHRA Greenbush ME	17650af				1800-1900	USA, WEWN Birmingham AL	11875na	13615na	15745eu	
1700-1800	USA, WHRI Noblesville IN	9495sa	13760na			1800-1900	USA, WGTG McCaysville GA	9400am			
1700-1800	USA, WINB Red Lion PA	13790am				1800-1900	USA, WHRA Greenbush ME	17650af			
1700-1800	USA, WJCR Upton KY	7490na	13595as			1800-1900	USA, WHRI Noblesville IN	9495sa	13760na		
1700-1800 irreg	USA, WMLK Bethel PA	9465am				1800-1900 irreg	USA, WINB Red Lion PA	13790am			
1700-1800	USA, WRNO New Orleans LA	7395na	15420al			1800-1900	USA, WJCR Upton KY	7490na	13595as		
1700-1800	USA, WSHB Cypress Crk SC	18910af				1800-1900	USA, WMLK Bethel PA	9465am			
1700-1800	USA, WWCR Nashville TN	9475na	12160na	13845na	15685na	1800-1900	USA, WRNO New Orleans LA	7395na	15420al		
1700-1800	USA, WYFR Okeechobee FL	15695eu	17555eu			1800-1900	USA, WSHB Cypress Crk SC	18910af	12160na	13845na	15685na
1700-1800	Zambia, Christian Voice	3330af	4965af			1800-1845	USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1700-1800	Zambia, Natl BC Corp	6165do	6265do			1800-1900 vl	USA, WYFR Okeechobee FL	15695eu	17555eu		
1700-1800 vl	Zimbabwe, Zimbabwe BC	3306do	4828do			1800-1825	Zambia, Christian Voice	3330af	4965af		
1715-1800 vl	Libya, Voice of Africa	15235va	15415va	15435va		1800-1900	Zambia, Natl BC Corp	6165do	6265do		
1715-1800	Swaziland, Trans World R	3200af				1800-1900 vl	Zimbabwe, Zimbabwe BC	3306do	4828do		
1730-1756	Belgium,R Vlaanderen Intl	5910eu	9925eu	11840af	13685eu	1805-1810	Libya, Voice of Africa	15235va			
1730-1800	Guam, AWR/KSDA	11965as				1830-1900	Swaziland, Trans World R	3200af			
1730-1800	Netherlands, Radio	6020af	7120af	11655af		1830-1900	Belgium,R Vlaanderen Intl	5910eu	9925eu	11840af	13685eu
1730-1800	Philippines, R Pilipinas	11720as	11890as	15190as		1830-1900	Guam, AWR/KSDA	11965as			
1730-1800	S Africa, AWR Africa	12130af				1830-1900	Netherlands, Radio	6020af	7120af	11655af	
1730-1800 mtwhfa	Sweden, Radio	6065eu				1830-1900	Philippines, R Pilipinas	11720as	11890as	15190as	
1730-1800 s	Sweden, Radio	9590eu				1830-1900	S Africa, AWR Africa	12130af			
1730-1800 s	UK, BBC World Service	12045as	15310as			1830-1900	Sweden, Radio	6065eu			
1730-1800	Vatican City, Vatican R	17365af	15570af	17550af		1830-1900	Sweden, Radio	9590eu			
1745-1800	Bangladesh, Bangla Betar	7185eu	7462eu	9548eu	15520eu	1830-1900 as	UK, BBC World Service	12045as	15310as		
1745-1800	India, All India Radio	7410eu	9635af	9950eu	11620eu	1840-1850	Vatican City, Vatican R	17365af	15570af	17550af	
		11935af	13780af	15075af	15200af	1850-1900 mtwhf	Bangladesh, Bangla Betar	7185eu	7462eu	9548eu	15520eu
						1855-1900 as	India, All India Radio	7410eu	9635af	9950eu	11620eu
								11935af	13780af	15075af	15200af



FREQUENCIES

1900-2000	Anguilla, Caribbean Beacon	11775am							2000-2100	Algeria, R Algiers Intl	11715af	11750af						
1900-2000 vl	Australia, ABC/Katherine	2485do							2000-2100	Anguilla,Caribbean Beacon	11775am							
1900-2000 vl	Australia, ABC/Tent Creek	2325do							2000-2100 vl	Australia, ABC/Alice Spgs	2310do							
1900-2000	Australia, Radio	6080pa	7240va	9500as	9580va				2000-2100 vl	Australia, ABC/Katherine	2485do							
		9660va	11880va						2000-2100 vl	Australia, ABC/Tent Creek	2325do							
1900-2000 vl	Botswana, Radio	4820do	4830do						2000-2100	Australia, Radio	9500as	9580va	9660va	11880va	12080va			
1900-1920	Brazil, R Nacional Bras	15265eu							2000-2100 vl	Botswana, Radio	4820do							
1900-2000	Bulgaria, Radio	9400eu	11720eu						2000-2100	Canada, CFRX Toronto	6070do							
1900-2000	Canada, CFRX Toronto	6070do							2000-2100	Canada, CFVP Calgary	6030do							
1900-2000	Canada, CFVP Calgary	6030do							2000-2100	Canada, CHNX Halifax	6130do							
1900-2000	Canada, CHNX Halifax	6130do							2000-2100	Canada, CKZN St John's	6130do							
1900-2000	Canada, CKZN St John's	6160do							2000-2100	Canada, CKZU Vancouver	6160do							
1900-2000	Canada, CKZU Vancouver	6160do							2000-2100	Canada, R Canada Intl	5995eu	11690eu	13650eu	13670eu				
1900-2000	China, China Radio Intl	9695af	9440af	9600af	11840af						15150eu	15325eu	17820eu					
1900-2000	Costa Rica,RF Peace Intl	15050am	21460am						2000-2100	China, China Radio Intl	6950eu	7170af	9440af	9535eu				
1900-2000	Ecuador, HCJB	17660eu	21455va								11840af	11975af	15500af					
1900-2000 mtwhf	Eqt Guinea, Radio Africa	7190af	15186af						2000-2100	Costa Rica,RF Peace Intl	15050am	21460am						
1900-1930	Finland, YLE/R Finland	6135eu							2000-2005	Croatia, Croatian Radio	13810af							
1900-1945	Germany, Deutsche Welle	9640af	11785af	11810af	13790af				2000-2027	Czech Rep, R Prague Intl	5930eu	11600va						
		15390af	17810af						2000-2100	Ecuador, HCJB	17660eu	21455va						
									2000-2100 mtwhf	Eqt Guinea, Radio Africa	7190af	15186af						
1900-2000	Germany, Sunrise Radio	5850eu							2000-2045	Germany, Deutsche Welle	11970eu							
1900-2000	Germany,Overcomer Ministr	3965eu							2000-2100	Germany,Overcomer Ministr	3965eu							
1900-2000 vl	Ghana, Ghana BC Corp	3366do	4915do						2000-2100 vl	Ghana, Ghana BC Corp	3366do	4915do						
1900-1910	Greece, Voice of	7475eu	9375eu						2000-2100	Guatemala, Adv World R	5980am							
1900-2000	Guatemala, Adv World R	5980am							2000-2100	Guyana, GBC/Voice of	3290af	5950do						
1900-2000	Guyana, GBC/Voice of	3290af	5950do						2000-2100	Indonesia, Voice of	15150va							
1900-1930	Hungary, Radio Budapest	6025eu	7170eu						2000-2030	Iran, VOIRI	7215eu	7260eu	9022eu					
1900-1945	India, All India Radio	7410eu	9635af	9950eu	11620eu				2000-2100 vl	Italy, IRRS	3985va							
		11935af	13780af	15075af	15200af				2000-2100	Kenya, Kenya BC Corp	4885do	4935do						
		11605va	15640af	17545va					2000-2100	Kuwait, Radio	11990am							
1900-1925	Israel, Kol Israel	3985va							2000-2100	Lebanon, Voice of Hope	9960me	4800do						
1900-2000 vl	Italy, IRRS	4885do	4935do						2000-2100 vl	Lesotho, Radio	5100do							
1900-2000	Kenya, Kenya BC Corp	11990am							2000-2055	Liberia,LCN/R Liberia Int	5100do							
1900-2000	Kuwait, Radio	9960me							2000-2100	Malaysia, Radio	7295do							
1900-2000	Lebanon, Voice of Hope	4800do							2000-2100 vl	Namibia, NBC	3270af	3289af						
1900-2000 vl	Lesotho, Radio	5100do							2000-2025	Netherlands, Radio	6020af	7120af	9895af	11655af				
1900-1915	Liberia,LCN/R Liberia Int	13700af	17605af	21590af							13700af	17605af	21590af					
1900-2000	Malaysia, Radio	12060eu							2000-2100	New Zealand, R NZ Intl	17675pa							
1900-2000	Malta, VO Mediterranean	9720eu	12015eu						2000-2015 vl	Niger, Voice du Sahel	5019do							
1900-1930	Mongolia, Voice of	9465as							2000-2100 vl	Nigeria, Radio/Ibadan	6050do							
1900-2000	N Marianas, KFBS Saipan	6020af	7120af	9895af	11655af				2000-2100 vl	Nigeria, Radio/Kaduna	4770do							
1900-2000	Netherlands, Radio	13700af	17605af	21590af					2000-2100	Nigeria, Radio/Lagos	3326do							
									2000-2100	Nigeria, Voice of	7255af	15120va						
1900-1950 mtwhf	New Zealand, R NZ Intl	11695pa							2000-2100 vl	Papua New Guinea, NBC	9675do							
1900-1958 as	New Zealand, R NZ Intl	11695pa							2000-2025	Poland, Polish R Warsaw	6035eu	6095eu	7285eu	9525eu				
1900-2000 vl	Nigeria, Radio/Ibadan	6050do							2000-2100	Russia,Voice of Russia WS	9720eu	9775eu	9820eu	11675eu				
1900-2000 vl	Nigeria, Radio/Kaduna	4770do									15485eu	15735eu						
1900-2000	Nigeria, Radio/Lagos	3326do							2000-2005	S Africa, Voice of Hope	6290af							
1900-2000	Nigeria, Voice of	7255af	15120va						2000-2100	Sierra Leone, SLBS	3316do							
1900-2000	North Korea, R Pyongyang	6520va	9600va	9975af					2000-2100 vl	Solomon Islands, SIBC	5020do							
1900-1930 vl	Papua New Guinea, NBC	9675do							2000-2100 mtwhf	Spain, R Exterior Espana	9595af	15285eu						
1900-1930 m-a/vl	Papua New Guinea, NBC	4890do							2000-2100	Swaziland, Trans World R	3200af							
1900-1930	Philippines, R Pilipinas	11720as	11890as	15190as					2000-2030	Switzerland, Swiss R Intl	13710af	13770af	15220af	17580af				
1900-2000	Russia,Voice of Russia WS	9480eu	9720eu	9875eu	9820eu				2000-2100	Uganda, Radio	4976do							
		11675eu	12070eu	15545eu	15735eu				2000-2100	UK, BBC World Service	3255af	3955eu	5975pa	6005af				
											6180eu	6190af	6195va	7325eu	9410eu	9630af		
1900-1930	Serbia, Radio Yugoslavia	7230au									9740pa	11835af	12095sa	15400af	17830af			
1900-2000	Sierra Leone, SLBS	3316do							2000-2100	UK, Merlin Network One	7235eu	13690na	17695eu					
1900-2000 vl	Solomon Islands, SIBC	5020do							2000-2100	USA, KAJI Dallas TX	13815na							
1900-2000	South Korea, R Korea Intl	5975om	7275eu						2000-2100	USA, KJES Vado NM	15385na							
1900-2000	Swaziland, Trans World R	3200af							2000-2100	USA, KBTN Salt Lk City UT	15590na							
1900-1930	Switzerland, Swiss R Intl	9885eu							2000-2100	USA, KWHR Naalehu HI	17510as							
1900-1930	Tanzania, Radio	5050af							2000-2100	USA, Voice of America	4950af	6035af	6095me	7375af				
1900-2000	Thailand, Radio	9535eu	9655eu	11905eu							9760af	9770af	11855af	11975af				
1900-1930	Turkey, Voice of	9670eu	11765eu	13695eu							15410af	15580af	17725af	17745af				
1900-2000	Uganda, Radio	4976do							2000-2100	USA, WBQO Monticello ME	7415af							
1900-2000	UK, BBC World Service	3255af	6005af	6180eu	6180eu				2000-2100	USA, WEWN Birmingham AL	11875na	13615na	15745eu					
		6190af	6195eu	9410eu	9630af	9740pa	11835af		2000-2100	USA, WGTC Mcaysville GA	8890na	9400am						
		11995me	12095eu	15400af	15485eu	17830af			2000-2100	USA, WHRA Greenbush ME	17650af							
1900-2000	UK, Merlin Network One	6175eu	13690eu	17830af					2000-2100	USA, WHRI Noblesville IN	5745sa	9495na						
1900-2000	USA, KAJI Dallas TX	13815na	15725af						2000-2100	USA, WINB Red Lion PA	13790am							
1900-2000	USA, KJES Vado NM	15385au							2000-2100	USA, WJCR Upton KY	7490na	13595as						
1900-2000	USA, KBTN Salt Lk City UT	15590na							2000-2045 as	USA, WRMI/R Miami Intl	9955am							
1900-2000	USA, KWHR Naalehu HI	17510as							2000-2100	USA, WRNO New Orleans LA	7395na	15420af						
1900-2000	USA, Voice of America	4950af	6035af	7375af	7415af				2000-2100	USA, WWSB Cypress Crk SC	15665eu	18910af						
		9760af	9770af	11870pa	11975af				2000-2045	USA, WWCN Nashville TN	9475na	12160va	13845na	15685na				
		15140af	15445af	15580af					2000-2010 vl	USA, WYFR Okeechobee FL	15695eu	17750va	17845af					
									2000-2010	Vanuatu, Radio	4960do							
											4005eu	5883eu	7250eu	9645eu				
											9660af	11625af	13765va					
											3330af	4965af						
											6165do	6265do						
											3306do	4828do						
											12085eu	13605eu						
											9660af	11625af	13765va					
											15235va	15415va	15435va					
											7220af	9710af	11880af					
											7270va	11960va						
											13720eu	13750eu						
											1375af							
											15560af							
											5935eu							
											7520eu							
											S Africa, AWR Africa	9745af						
											Thailand, Radio	9535eu	9655eu	11905eu				
											Turkey, Voice of	7170va						
											USA, Voice of America	4950af						
											Uzbekistan, R Tashkent	4850eu	5995eu	7105eu	9540eu			
											9540eu							
											5940eu	7270eu	7400eu	9730as				



FREQUENCIES

2100-2200	Anguilla, Caribbean Beacon	11775am			
2100-2130 vl	Australia, ABC/Alice Spgs	2310do			
2100-2130 vl	Australia, ABC/Katherine	2485do			
2100-2200 vl	Australia, ABC/Katherine	5025do			
2100-2130 vl	Australia, ABC/Tent Creek	2325do			
2100-2200	Australia, Radio	7240pa	9500as	9580va	9660pa
		11880va	12080va	17580va	21740va
2100-2200 vl	Botswana, Radio	3356do	4820do		
2100-2200	Bulgaria, Radio	9400eu	11720eu		
2100-2200 vl	Canada, CBC N Quebec Svc	9625do			
2100-2200	Canada, CFRX Toronto	6070do			
2100-2200	Canada, CFVP Calgary	6030do			
2100-2200	Canada, CHNX Halifax	6130do			
2100-2200	Canada, CKZN St John's	6160do			
2100-2200	Canada, CKZU Vancouver	6160do			
2100-2130	Canada, R Canada Intl	7235eu	11690eu	13650eu	13670eu
		15150eu	15325eu	17820eu	
2100-2130	China, China Radio Intl	6950eu	9535eu	11975af	15500af
2100-2200	Costa Rica, RF Peace Intl	15050am	21460am		
2100-2130	Cuba, Radio Havana	13720eu	13750eu		
2100-2200	Ecuador, HCJB	17660eu			
2100-2200	Egypt, Radio Cairo	15375af			
2100-2200 mtwhf	Eqi Guinea, Radio Africa	7190af	15186af		
2100-2145	Germany, Deutsche Welle	9670as	9765as	9875af	11865af
		11915as	13780as	15135va	
2100-2200 vl	Ghana, Ghana BC Corp	3366do	4915do		
2100-2200	Guyana, GBC/Voice of	3290al	5950do		
2100-2130	Hungary, Radio Budapest	6025eu			
2100-2200	India, All India Radio	7150au	7410eu	9650eu	9910au
		9950eu	11620eu	11715au	
2100-2130 irreg	Iraq, Radio Iraq Intl	9685va			
2100-2200 vl	Italy, IRRS	3985va			
2100-2200	Japan, Radio/NHK	6035pa	9725eu	17825na	21610pa
2100-2130	Kenya, Kenya BC Corp	4885do	4935do		
2100-2200 vl	Lesotho, Radio	4800do			
2100-2115	Liberia, LCN/R Liberia Int	5100do			
2100-2200	Malaysia, Radio	7295do			
2100-2200 vl	Namibia, NBC	3270af	3289af		
2100-2200	New Zealand, R NZ Intl	17675pa			
2100-2200 vl	Nigeria, Radio/Ibadan	6050do			
2100-2200 vl	Nigeria, Radio/Kaduna	4770do			
2100-2200	Nigeria, Radio/Lagos	3326do			
2100-2200	North Korea, R Pyongyang	4405as	6575eu	9335eu	11710am
		13760am			
2100-2200	Palau, KHBN/Voice of Hope	9985as			
2100-2200 vl	Papua New Guinea, NBC	9675do			
2100-2200	Romania, R Romania Intl	9570eu	11810eu	11840eu	15180eu
2100-2130	Serbia, Radio Yugoslavia	6100eu	6185eu		
2100-2200	Sierra Leone, SLBS	3316do			
2100-2200 vl	Solomon Islands, SIBC	5020do			
2100-2130	South Korea, R Korea Intl	3970eu	6480eu	15575eu	
2100-2200 s	Spain, R Exterior Espana	9595af	15105eu		
2100-2200	Swaziland, Trans World R	3200af			
2100-2200	Syria, Radio Damascus	12085na	13605na		
2100-2130	Turkey, Voice of	7170va			
2100-2200	UK, BBC World Service	3255af	3915as	3955eu	5965as
		5975va	6190af	6195va	7325eu
		9410eu	11835af	11945as	12095sa
					15400af
2100-2200	UK, Merlin Network One	13690na	17695eu		
2100-2200	Ukraine, R Ukraine Intl	5905eu	6020eu	7410eu	9550na
		9560eu	12040na	13590eu	
2100-2200	USA, KAIJ Dallas TX	13815na			
2100-2200	USA, KTBN Salt Lk City UT	15590na			
2100-2200	USA, KWHR Naalehu HI	17510as			
2100-2200	USA, Voice of America	6035af	6040me	7375af	7415af
		9535af	9705as	11870pa	11975af
		15410af	15445af	15580af	17735as
2100-2200	USA, WBCQ Monticello ME	7415na			
2100-2200	USA, WEWN Birmingham AL	5825na	13615na	15745eu	
2100-2200	USA, WGTG McCaysville GA	6890na	9400am		
2100-2200	USA, WHRA Greenbush ME	17650af			
2100-2200	USA, WHRI Noblesville IN	5745na	9495sa		
2100-2200	USA, WINB Red Lion PA	13790am			
2100-2200	USA, WJCR Upton KY	7490na	13595as		
2100-2130 a	USA, WRMI/R Miami Intl	9955am			
2100-2200	USA, WRNO New Orleans LA	7395na	15420al		
2100-2200	USA, WSHB Cypress Crk SC	11890af	15665eu		
2100-2200	USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
2100-2200	USA, WYFR Okeechobee FL	15215eu	15695af	17845va	
2100-2200 vl	Vanuatu, Radio	4960do			
2100-2200	Zambia, Christian Voice	3330af	4965af		
2100-2200	Zambia, Natl BC Corp	6165do	6265do		
2100-2200 vl	Zimbabwe, Zimbabwe BC	3306do	4828do		
2105-2200 a	Spain, R Exterior Espana	9595af	15105eu		
2115-2145 mtwhfa	Armenia, Voice of	4810va	9965va		
2115-2200	Egypt, Radio Cairo	9900eu			
2115-2130 mtwhf	UK, BBC Caribbean Report	5975ca	15390ca	17715ca	
2115-2130 as	UK, BBC World Service	5975am			
2130-2200	Albania, R Tirana Intl	7160eu	9635eu		
2130-2200 vl	Australia, ABC/Tent Creek	4910do			
2130-2200	Austria, R Austria Intl	6155eu			

2130-2200 smtwha	Austria, R Austria Intl	5945eu	13730af		
2130-2200	China, China Radio Intl	6950eu	9535eu		
2130-2157	Czech Rep, R Prague Intl	11600va	15545af		
2130-2200	Guam, AWR/KSDA	15550as			
2130-2200	Hungary, Radio Budapest	3975eu			
2130-2200	Iran, VOIRI	6165au	9725as		
2130-2155	Moldova, R Moldova Intl	7520eu			
2130-2200	South Korea, R Korea Intl	15575eu			
2130-2200	Sweden, Radio	6065eu	9430eu		
2130-2145 tf	UK, BBC Calling Falklands	11680sa			
2130-2200	USA, Voice of America	6040me	9535af	9705as	11870pa
		15185as	17735as		
2130-2200 smtwhf	USA, Voice of America	6035af	7375af	7415af	11975af
		15410af	15445af	15580af	17725af

2200 UTC

2200-2300	Anguilla, Caribbean Beacon	6090am			
2200-2300 vl	Australia, ABC/Katherine	5025do			
2200-2300 vl	Australia, ABC/Tent Creek	4910do			
2200-2300	Australia, Radio	17580va	17795va	21740va	
2200-2300	Canada, CBC N Quebec Svc	9625do			
2200-2300	Canada, CFRX Toronto	6070do			
2200-2300	Canada, CFVP Calgary	6030do			
2200-2300	Canada, CHNX Halifax	6130do			
2200-2300	Canada, CKZN St John's	6160do			
2200-2300	Canada, CKZU Vancouver	6160do			
2200-2230	Canada, R Canada Intl	5960na	9755na	11705as	13670am
		15305am			
2200-2300	China, China Radio Intl	7170eu			
2200-2300	Costa Rica, RF Peace Intl	15050am	21460am		
2200-2245	Egypt, Radio Cairo	9900eu			
2200-2300 mtwhf	Eqi Guinea, Radio Africa	7190af	15186af		
2200-2300 vl	Ghana, Ghana BC Corp	3366do	4915do		
2200-2300	Guyana, GBC/Voice of	3290al	5950do		
2200-2230	India, All India Radio	7150au	7410eu	9650eu	9910au
		9950eu	11620eu	11715au	
2200-2230	Iran, VOIRI	6165au	9725as		
2200-2225	Italy, RAI Intl	9675as	11900as	15240as	
2200-2215	Liberia, LCN/R Liberia Int	5100do			
2200-2300	Malaysia, Radio	7295do			
2200-2230	Mexico, Radio Mexico Intl	5985al	9705am		
2200-2300 vl	Namibia, NBC	3270af	3289af		
2200-2300	New Zealand, R NZ Intl	17675pa			
2200-2300 vl	Nigeria, Radio/Ibadan	6050do			
2200-2300 vl	Nigeria, Radio/Kaduna	4770do			
2200-2300	Nigeria, Radio/Lagos	3326do			
2200-2300	Palau, KHBN/Voice of Hope	9985as			
2200-2300 vl	Papua New Guinea, NBC	9675do			
2200-2300	Sierra Leone, SLBS	3316do			
2200-2300 vl	Solomon Islands, SIBC	5020do			
2200-2215	Swaziland, Trans World R	3200af			
2200-2205	Syria, Radio Damascus	12085eu	13605na		
2200-2300	Taiwan, Radio Taipei Intl	15600eu	17750eu		
2200-2300	Turkey, Voice of	7190eu	13640na		
2200-2300	UK, BBC World Service	5965as	5975am	6175am	6195va
		7110as	9590am	9890as	9915sa
		11835af	11955as	12080pa	12095sa
					15400af
2200-2300	UK, Merlin Network One	3985eu	9850as	11985na	
2200-2300	USA, KAIJ Dallas TX	13815na	15725al		
2200-2300	USA, KTBN Salt Lk City UT	15590na			
2200-2300	USA, KWHR Naalehu HI	17510as			
2200-2230 mtwhf	USA, Voice of America	6035af	7215as	7340af	7375as
		7415af	9705as	9770as	11760as
		15185as	15290as	15305as	17735as
2200-2300	USA, WBCQ Monticello ME	7415na			
2200-2300	USA, WEWN Birmingham AL	5825na	5850eu	9975eu	13615na
2200-2300	USA, WGTG McCaysville GA	5085am	6890na		
2200-2300	USA, WHRA Greenbush ME	17650af			
2200-2300	USA, WHRI Noblesville IN	5745na	9495sa		
2200-2300	USA, WINB Red Lion PA	13790am			
2200-2300	USA, WJCR Upton KY	7490na	13595as		
2200-2230 a	USA, WRMI/R Miami Intl	9955am			
2200-2300	USA, WRNO New Orleans LA	7395na	15420al		
2200-2300	USA, WSHB Cypress Crk SC	13770eu	15285sa		
2200-2300	USA, WWCR Nashville TN	5070na	7435na	9475na	13845na
2200-2245	USA, WYFR Okeechobee FL	11740na	15215af	17845va	
2200-2300 vl	Vanuatu, Radio	4960do			
2200-2210	Zambia, Natl BC Corp	6165do	6265do		
2230-2256	Belgium, R Vlaanderen Intl	15565na			
2230-2300	Canada, R Canada Intl	5960na	9755na	13670na	
2230-2300	Cuba, Radio Havana	9550am			
2230-2257	Czech Rep, R Prague Intl	11600na	15545na		
2230-2300	USA, Voice of America	7215as	9705as	9770as	11760as
		15185as	15290as	15305as	17735as
			9425au	11645au	17820as
2240-2250	Greece, Voice of	7410as	9705as	9950as	11620as
2245-2300	India, All India Radio	13625as			
2245-2300	USA, WYFR Okeechobee FL	11740na			
2245-2300	Vatican City, Vatican R	9600as	11830as		

FREQUENCIES

2300-0000	Anguilla, Caribbean Beacon	6090am				2300-0000 vl	Solomon Islands, SIBC	5020do			
2300-0000 vl	Australia, ABC/Katherine	5025do				2300-0000	UK, BBC World Service	3915as	5965as	5975am	6035as
2300-0000 vl	Australia, ABC/Tent Creek	4910do						6175am	6195as	7110as	9590am
2300-0000	Australia, Radio	9660pa	12080va	17580va	17795va			9915sa	11945as	11955as	12095sa
		21740pa						15280as			
2300-0000	Bulgaria, Radio	9500na	11700na			2300-0000	UK, Merlin Network One	3985eu	9850as	11985na	
2300-0000	Canada, CBC N Quebec Svc	9625do				2300-0000	USA, KAIJ Dallas TX	13740al	13815na	15725al	
2300-0000	Canada, CFRX Toronto	6070do				2300-0000	USA, KTVN Salt Lk City UT	15590na			
2300-0000	Canada, CFVP Calgary	6030do				2300-0000	USA, KWHR Naalehu HI	17510as			
2300-0000	Canada, CHNX Halifax	6130do				2300-0000	USA, Voice of America	7215as	9705as	9770as	11760as
2300-0000	Canada, CKZN St John's	6160do						15185as	15290as	15305as	17735as
2300-0000	Canada, CKZU Vancouver	6160do						17820as			
2300-2330	Canada, R Canada Intl	5960na	9755na	11895am	13670am	2300-0000	USA, WBCQ Monticello ME	7415na			
		15305am				2300-0000	USA, WEWN Birmingham AL	5825na	5850eu	9975eu	13615na
2300-0000	Costa Rica, RF Peace Intl	15050am	21460am			2300-0000	USA, WGTG McCaysville GA	5085am	6890na		
2300-2330	Cuba, Radio Havana	9550am				2300-0000	USA, WHRA Greenbush ME	17650af			
2300-0000	Egypt, Radio Cairo	9900am				2300-0000	USA, WHRI Noblesville IN	5745na	9495sa		
2300-2345	Germany, Deutsche Welle	9715as	9815as	11965as		2300-0000	USA, WINB Red Lion PA	13790am			
2300-0000 s	Germany, Good News World	9405sa				2300-0000	USA, WJCR Upton KY	7490na	13595as		
2300-0000 vl	Ghana, Ghana BC Corp	3366do	4915do			2300-0000	USA, WRNO New Orleans LA	7355na	15420al		
2300-0000	Guyana, GBC/Voice of	3290al	5950do			2300-0000	USA, WSHB Cypress Crk SC	13770va	15285am		
2300-0000	India, All India Radio	7410as	9705as	9950as	11620as	2300-0000 as	USA, WWBS Macon GA	11900na			
		13625as				2300-0000	USA, WWCR Nashville TN	5070na	7435na	9475na	13845na
2300-2315	Liberia, LCN/R Liberia Int	5100do				2300-2345	USA, WYFR Okeechobee FL	11740na			
2300-0000	Malaysia, Radio	7295do				2300-0000 vl	Vanuatu, Radio	4960do			
2300-2330	Mexico, Radio Mexico Intl	5985al	9705am			2300-2305	Vatican City, Vatican R	9600as	11830as		
2300-0000 vl	Namibia, NBC	3270af	3289af			2310-2320	Kyrgyzstan, Kyrgyz Radio	4010do	4050do		
2300-0000	New Zealand, R NZ Intl	17675pa				2315-0000 vl	Libya, Voice of Africa	15235va	15415va	15435va	
2300-2330 vl	Nigeria, Radio/Ibadan	6050do				2330-0000	Canada, R Canada Intl	5960na	9755na	13670am	
2300-2330 vl	Nigeria, Radio/Kaduna	4770do				2330-0000 as	Canada, R Canada Intl	11895am	15305am		
2300-2330	Nigeria, Radio/Lagos	3326do				2330-0000 vl	Guatemala, Radio Cultural	3300do			
2300-0000	North Korea, R Pyongyang	4405as	11335am	13760am	15130am	2330-2335	Israel, Kol Israel	11585af	15615af	15640na	
2300-0000	Palau, KHBN/Voice of Hope	9955as	9965as	9985as		2330-0000	Malaysia, RTM Sarawak	7160do			
2300-0000 vl	Papua New Guinea, NBC	9675do				2330-0000	Netherlands, Radio	6165na	9845na		
2300-0000	Romania, R Romania Intl	9570eu	11810eu	11830na	15105na	2330-2355	Vietnam, Voice of	5940af	7270af	7400af	9840am
2300-0000	Sierra Leone, SLBS	3316do						12019am			
2300-0000	Singapore, R Corp Singapore	6150do				2340-2350	Greece, Voice of	7450sa	9375sa	9420sa	11645sa
								12105sa			

SELECTED PROGRAMS

Sundays

2300	BBC (AE): World News. See S 0000.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: CBC Radio News. See S 0200.
2305	Canada, RCI Montreal: Roots and Wings. Philly Markowitz plays the rare, the beautiful and the unexpected music from the four corners of our world.
2330	BBC (AE): Wright Round the World. See S 0305.
2330	Israel, Kol Israel: News. See S 1400.

Mondays

2300	BBC (AE): World News. See S 0000.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: The World at Six. CBC radio's major newscast of the day, presenting the important stories in depth and in context.
2305	BBC (AE): Outlook. See M 1205.
2330	Israel, Kol Israel: News. See S 1400.
2345	BBC (AE): Insight. See M 1645.

Tuesdays

2300	BBC (AE): World News. See S 0000.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: The World at Six. See M 2300.
2305	BBC (AE): Outlook. See M 1205.
2330	Israel, Kol Israel: News. See S 1400.
2345	BBC (AE): Insight. See M 1645.

Wednesdays

2300	BBC (AE): World News. See S 0000.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: The World at Six. See M 2300.
2305	BBC (AE): Outlook. See M 1205.
2330	Israel, Kol Israel: News. See S 1400.
2345	BBC (AE): Insight. See M 1645.

Thursdays

2300	BBC (AE): World News. See S 0000.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: The World at Six. See M 2300.
2305	BBC (AE): Outlook. See M 1205.
2330	Israel, Kol Israel: News. See S 1400.
2345	BBC (AE): Insight. See M 1645.

Fridays

2300	BBC (AE): World News. See S 0000.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: The World at Six. See M 2300.
2305	BBC (AE): Outlook. See M 1205.
2330	BBC (AS): Variable Feature. See S 0601.

2330	Israel, Kol Israel: News. See S 1400.
2345	BBC (AE): Insight. See M 1645.

Saturdays

2300	BBC (AE): Play of the Week (from 2230). See S 1130.
2300	BBC (AS): The World Today. See S 0000.
2300	Canada, RCI Montreal: CBC Radio News. See S 0200.
2305	Canada, RCI Montreal: Global Village. Vignettes about music in the little corners of the world.
2330	BBC (AE): The Vintage Chart Show. See M 0530.
2330	BBC (AS): Variable Feature. See S 0601.
2330	Israel, Kol Israel: News. See S 1400.

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THANK YOU...

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Knife Edge Refraction

In my March 1999 column, I discussed one unusual mode of VHF propagation: the ducting mode that allows VHF transmissions to reach receivers not in the normal line of sight of the transmitter. Another unusual propagation mode results from the "knife edge refraction" phenomena.

If you recall your high school physics laboratory, the rays of a pointer or laser light positioned behind a very sharp knife edge such as a straight razor blade, will be deflected (refracted) downward after being intercepted by the horizontal knife edge. Replace the source of light by a source of VHF radiation and the knife edge by a mountain range, and you can observe the same phenomena. This can account for some cases of interference or unusual coverage as in the following example.

Because of their proximity to each other, the United States and Canada have, of necessity, practiced frequency coordination in many areas of spectrum management. In order that US residents did not rely on Canadian Weather Office forecasts and vice versa, coordination of weather radio service frequencies was especially important, since both services use the same frequencies.

For the weather radio system to be effective, transmitter sites were located on high buildings or mountains. One transmitter site near Burlington, Vermont, was on top of Mount Mansfield (altitude 4,400 ft), which was already host to many TV, FM, and ham transmitters. Although coordinators knew the transmission would be heard in the Montreal area, there would be a much stronger source of weather information available on a different frequency when the Canadian installation was completed.

Weather radio transmitters were finally installed in Canada and started transmitting on the coordinated frequencies; in many cases repeaters were installed to insure coverage in less populated areas. One such repeater was constructed about 20 miles northwest of the town of Cornwall, Ontario. The frequency chosen was the same as the frequency used by the transmitter on Mt. Mansfield located 105 miles away.

From Cornwall, Mt. Mansfield is not visible even on a clear day. But between these two points there is a mountain range with sharp summits: the Adirondacks. It would appear that these mountains were acting as a knife edge and refracting the signal into certain parts of Cornwall but not into others. The signal strength was high enough to override the signal transmitted from the Canadian transmitter located only 20 miles away. If you drove around town with a VHF radio, depending on what street

OPTIMUM WORKING FREQUENCIES (MHz)																								
For the Period 15 June to 14 July 1999 Flux=181 SSN=141																								
Predictions prepared using ASAPS for Windows®																								
UTC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
TO/FROM US WEST COAST																								
SOUTH AMERICA	21	21	21	21	20	18	17	17	17	15	14	14	14	15	18	19	20	21	22	22	22	23	22	21
WESTERN EUROPE	15	14	13	12	12	11	12	13	12	*	*	*	*	*	15	17	18	18	17	16	17	17	17	16
EASTERN EUROPE (P)	14	14	14	15	15	16	15	14	*	*	*	*	*	*	15	15	15	16	16	16	16	15	15	15
MEDITERRANEAN	18	19	18	17	17	17	15	14	*	*	*	*	*	15	16	17	18	18	19	19	19	19	19	19
MIDDLE EAST (P)	15	15	17	18	19	18	16	*	*	*	*	*	*	*	16	18	19	20	19	18	17	17	16	15
CENTRAL AFRICA	18	19	18	16	14	13	15	15	14	*	*	*	*	*	17	19	21	21	22	22	22	21	20	19
SOUTH AFRICA	13	12	10	9	9	8	12	15	15	14	*	*	*	16	17	19	21	22	22	22	19	17	15	14
SOUTH EAST ASIA (P)	20	19	18	18	19	19	18	17	15	14	13	13	12	12	13	15	18	19	20	20	18	17	17	20
FAR EAST	19	18	16	17	18	18	17	15	14	13	12	11	11	11	12	14	16	15	14	15	16	17	18	19
AUSTRALIA	22	22	22	22	23	21	20	19	18	18	17	16	14	14	14	13	13	*	*	*	15	22	22	23
TO/FROM US MIDWEST																								
SOUTH AMERICA	19	19	20	18	17	16	16	16	15	14	13	13	14	16	18	19	20	20	20	21	21	20	20	19
WESTERN EUROPE	18	16	15	15	13	13	13	13	12	*	*	*	14	16	17	17	18	18	17	16	17	18	18	18
EASTERN EUROPE	14	14	14	14	15	15	13	*	*	*	*	*	*	14	15	15	15	16	16	16	16	16	15	15
MEDITERRANEAN	19	19	18	17	16	15	14	13	*	*	*	*	*	16	17	18	18	18	19	19	19	19	18	18
MIDDLE EAST (P)	15	15	16	18	18	15	*	*	*	*	*	*	14	16	18	20	21	21	20	19	18	18	17	15
CENTRAL AFRICA	20	20	18	16	14	13	16	15	14	*	*	*	15	18	19	21	22	22	22	22	21	20	19	18
SOUTH AFRICA	13	12	10	9	9	8	12	16	15	13	*	14	16	18	19	21	22	22	22	22	19	17	16	14
SOUTH EAST ASIA (P)	19	17	18	19	19	18	16	*	*	*	*	11	12	14	16	18	20	21	21	19	18	17	17	20
FAR EAST	17	17	17	18	18	17	16	14	13	12	12	11	11	12	14	15	15	15	15	15	16	17	17	18
AUSTRALIA	20	21	21	22	21	19	18	17	16	16	15	14	13	13	13	13	*	*	*	*	15	22	22	21
TO/FROM US EAST COAST																								
SOUTH AMERICA	17	17	17	16	15	15	15	14	13	12	11	13	16	17	17	18	19	19	19	19	18	18	18	18
WESTERN EUROPE	16	15	14	13	13	12	12	11	11	11	12	15	17	18	19	19	19	18	17	17	17	17	17	18
EASTERN EUROPE	13	13	12	13	14	13	12	*	*	*	*	14	16	18	18	17	17	17	18	18	17	16	15	15
MEDITERRANEAN	19	18	17	15	15	15	14	12	*	*	*	15	16	17	17	18	18	18	18	18	18	17	18	19
MIDDLE EAST (P)	16	15	16	17	15	14	*	*	*	*	*	15	16	17	18	18	19	18	18	18	18	18	18	16
CENTRAL AFRICA	21	20	19	16	14	13	16	15	14	15	17	19	20	21	21	22	22	22	22	21	21	20	21	21
SOUTH AFRICA	13	12	11	9	8	8	13	15	14	14	16	18	20	20	21	22	22	22	22	21	19	17	16	14
SOUTH EAST ASIA (P)	18	18	19	17	15	*	*	*	*	*	*	14	17	18	20	21	21	21	21	19	18	17	16	17
FAR EAST	17	18	18	18	17	15	14	13	12	11	12	13	14	16	16	16	16	15	15	15	16	17	18	18
AUSTRALIA	19	20	20	19	18	17	16	16	15	14	13	13	14	14	13	*	*	*	*	*	15	21	20	19

* Unfavorable conditions: Search around the last listed frequency for activity.
(P) denotes circuit across polar auroral zone; reception may be poor during ionospheric disturbances.

you were driving and on what side of the street you were, you would get either the Canadian or the American weather forecast!

It was also possible to duplicate this situation in reverse by using a high powered VHF ham transmitter — at times you could key up the ham repeater on Mt. Mansfield by pointing your antenna towards the mountaintops across the river. Again, the location of the transmitter in town was crucial to the success of this experiment.

It is an interesting situation, in which the

Canadian side of the river hears the US forecast and the US side hears the Canadian weather forecasts from its repeater about 30 miles away. Mount Mansfield's transmissions are blocked by the shadow of the same mountains which help the transmissions reach Canadian soil.

Now that summer has really arrived, DX conditions are not the best, but use the time to insure that your antennas and ground systems are in perfect conditions; do not wait till we get "antenna weather" (winter!) to look into rebuilding antenna or running new feedlines.

Down Memory Lane

May's column extended an offer to test your knowledge of late '60s shortwave radio programming. To refresh your memory (or in case you missed last month's issue), here are the lists and instructions we gave. If you still want to play, just cover text above the box.

■ The Answers

Here are the correct responses given in the order in which the programs are arranged in the first column. The numbers that appear within the text enumerate the sixty possible correct answers, which are also highlighted. Bonus points are in italics. Even if you weren't a shortwave listener in the 1960s, I hope you'll find the history lesson interesting all the same. [Source: *World Radio TV Handbook* 1965, 1967, 1968 editions.]

Saturday (1) Show (2) was a popular weekly pop/rock music program hosted by **Roger Wallis** (3) on **Radio Sweden** (4), a station whose name was changed briefly some years later to Radio Sweden International but remains **Radio Sweden** today (5).

Sweden Calling DXers (6) was the shortwave-focused forerunner of today's satellite-centered "Media Scan" hosted for decades by **Arne Skoog** (7), also on **Radio Sweden** (8). It aired every **Tuesday** (9).

Radio Newsreel (10) was, in essence, "From Our Own Correspondent" with a focus more on breaking news than background stories. It even had a theme that evoked the old Movietone newsreels of days gone by. A mainstay of the **BBC World Service** (11) stretching back at least to the war years, it was dropped from the schedule only a few short years ago. It was hosted by **various station staff** (12) on a **daily** (13) basis. *The BBC, of course, has retained its identity over the intervening years* (14).

Happy Station (15) was broadcast for over a half century — "the friendly program of smiles across the miles..." — and hosted for nearly as

long by **Eddie Startz** (16), every **Sunday** (17) on **Radio Nederland** (18) — today known as **Radio Netherlands** (19). (If you knew that Tom Meyer, the late Pete Myers, and then Jonathan Groubert succeeded Mr. Startz before the program was discontinued during the '90s, award yourself a couple of "attaboys" (or "attagirls").

Listeners' Choice (20) was an extremely popular music request and dedication program presented by the inimitable **Keith Glover** (21) over the airwaves of **Radio Australia** (22). It was broadcast **daily and on Sunday** (23). Although it has lost two transmitting complexes in recent years, *Radio Australia has kept its name* (24).

This World We Live In (25) was a **daily weekday** (26) variety program featuring conversation, music and listener requests. It was hosted by **Hill Edell** (27) on the very popular **Radio New York Worldwide (WNYW)** (28). *In the early '70s, WNYW went out of business and its transmitters were sold and then moved from Scituate, Massachusetts, to Okeechobee, Florida, where they became Family Radio, WYFR* (29).

The Swiss Shortwave Merry-Go-Round (30) was a much revered hobbyist program for shortwave listeners that was unique for its focus on responding to listeners' technical questions about shortwave and amateur antennas, receivers and transmitters. It was broadcast over **Switzerland Calling** (31) on **Saturdays** (32) and hosted by "The Two Bobs" — **Bob Thomann** (33) and Bob Zanotti. Even after having left the air nearly a decade ago, it is still greatly missed. *Today the station is known as Swiss Radio International* (34). (If you thought it was now "World Radio Switzerland," give yourself a swift kick. That's the name of the station's daily news magazine.)

My Favourite Spot (35) was a **Friday** (36) program on **Switzerland Calling** (37) in which the **various staff members** (38) of the English Service took turns describing for listeners their favorite places in Switzerland. The "Name Game" program today, airing the first Saturday of each

month, is similar in concept and content.

His and Hers (39) featured the husband and wife team of Jerry and **Dody Cowan** (40) cheerfully bantering with one another while reading letters and playing music requests from listeners. This most pleasant of programs aired every **Tuesday** (41) on **Radio Nederland** (42). (I admit it! I had a schoolboy crush on Dody. She never knew.)

The **Radio Canada Shortwave Club** (43) really was a full-fledged club that provided its members with a membership card, a numbered certificate and a wealth of useful information about shortwave listening and DXing. Its programs were termed "meetings" and were held every **Saturday** (44) on the airwaves of **Radio Canada** (45), chaired by club president **S.B. "Pip" Duke** (46). (If you also knew that Duncan Nicholson was vice-president and Simone Rubal was club secretary, give yourself a pat on the back.) *Today, the station is Radio Canada International* (47).

The Worldwide Hit Parade (48) was **Radio New York Worldwide's** (49) most popular program. It aired **every day but Sunday** (50) and featured a five-hour mix of popular, jazz and country music. It was hosted by **Les Marchak** (51).

Arthur Cushen's (52) **DX World** (53) was a program of listening tips from the now legendary DXer and SWL who passed away just last year. Diligently produced by Arthur right up until a few weeks before he succumbed to illness, it aired the **first Wednesday of the month, repeated the following Sunday** (54) during the late '60s, on **Radio New Zealand** (55), *which is known today as Radio New Zealand International* (56).

Radio RSA is now known as Channel Africa (57). *Radio Peking became Radio Beijing and is now China Radio International* (58). *O.R.T.F. stands for Office de Radiodiffusion-Télévision Française which has become today's Radio France Internationale* (59). *Radio Moscow is now the Voice of Russia* (60).

Next month it's back to the future (or, at least the present). Until then, good listening!

A '60S SHORTWAVE MATCH GAME

Match each of the three columns to include the program, station on which it was broadcast, and a personality associated with the program. Give yourself one point for each correct answer with bonus points if you can (1) remember the day or days of the week the program aired; (2) give the present-day name for the stations on the list. Top score will be 60 points.

Two cautions: while all of the programs and personalities have matches, not all of the stations do! Some the stations may have more than one program and personality associated with them. Good luck!

Programs

Saturday Show
_____ Calling DXers
Radio Newsreel
Happy Station
Listeners' Choice
This World We Live In
_____ Shortwave Merry-Go-Round
My Favorite Spot
His and Hers
_____ Shortwave Club
The Worldwide Hit Parade
_____ DX World

Stations

Radio Nederland
Radio RSA
Switzerland Calling
Radio Sweden
Radio Peking
Radio Canada
Radio New Zealand
O.R.T.F.
Radio Australia
Radio New York Worldwide (WNYW)
BBC
Radio Moscow

Personalities

Hill Edell
Keith Glover
Arthur Cushen
Various station staff
Roger Wallis
Arne Skoog
Dody Cowan
Bob Thomann
Eddie Startz
Les Marchak
Pip Duke

SATELLITE RADIO GUIDE



INTERNATIONAL SHORTWAVE BROADCASTERS (via satellite)

By Larry Van Horn, MT Assistant Editor

WRN One English to North America

Galaxy 5, 125 degrees West, transponder 6 (TBS) 3.820 GHz, V-Pol, audio subcarrier 6.80 MHz. WRN program details can be heard at 0625, 1525 and 1955 Eastern. Program information is also available on TBS Text page 204. You can reach WRN by email at online@wrn.org or through their website on the internet at <http://www.wrn.org>. Many programs can also be heard in Canada on *CBC English Overnight*. WRN is relayed 24 hours a day on many cable systems via the CSPAN Audio One Network. All times are U.S. Eastern Time and all programs in English.

ET	Station
0000	Radio Telefis Eireann (RTE) – Dublin, Ireland (Irish Collection)
0100	Swiss Radio International – Berne, Switzerland
0130	Monday-Friday: Channel Africa – Auckland Park, South Africa Saturday: <i>The Way Ahead and New Horizons</i> Sunday: Glenn Hauser's <i>World of Radio</i>
0200	Polish Radio – Warsaw, Poland
0230	Radio Vlaanderen International – Brussels, Belgium (Brussels Calling)
0300	Radio Australia – Melbourne, Australia
0400	Voice of Russia – Moscow, Russia
0430	Radio Canada International – Montreal, Canada (Monday-Friday) Saturday: <i>Network Plus and Health Watch</i> Sunday: United Nations Radio: <i>World in Review and Scope</i>
0500	Radio Prague – Prague, Czech Republic
0530	Radio Vlaanderen International – Brussels, Belgium (Brussels Calling)
0600	Swiss Radio International – Berne, Switzerland
0630	YLE Radio Finland – Helsinki, Finland
0700	Radio Australia – Melbourne, Australia
0800	Radio Telefis Eireann (RTE) – Dublin, Ireland
0900	Radio Prague – Prague, Czech Republic
0930	Radio Sweden – Stockholm, Sweden
1000	Monday-Saturday: Channel Africa – Auckland Park, South Africa Sunday: Voice of America <i>Communications World</i> – Washington, DC USA
1030	Radio Vlaanderen International – Brussels, Belgium (Brussels Calling)
1100	Radio France International – Paris, France
1200	Monday-Friday: <i>Caribbean Tempo</i> from CANA Radio Saturday: Glenn Hauser's <i>World of Radio</i> Sunday: <i>Norden This Week and Health Watch</i>
1215	Monday-Friday: Vatican Radio – Vatican City (World News)
1230	Radio Austria International – Vienna, Austria
1300	Monday-Friday: British Broadcasting Corporation – London, England (Europe Today) Saturday: Radio New Zealand International, Wellington Sunday: Radio Denmark – Copenhagen, Denmark (Copenhagen Calling)
1330	Radio Telefis Eireann (RTE) – Dublin, Ireland
1400	Radio Vlaanderen International – Brussels, Belgium (Brussels Calling)
1430	Kol Israel – Jerusalem, Israel
1500	Radio Budapest – Budapest, Hungary
1530	Radio Sweden – Stockholm, Sweden
1600	Swiss Radio International – Berne, Switzerland
1630	Polish Radio – Warsaw, Poland
1700	Radio Telefis Eireann (RTE) – Dublin, Ireland
1900	Kol Israel – Jerusalem, Israel
1930	Swiss Radio International – Berne, Switzerland
2000	Radio Australia – Melbourne, Australia
2030	Monday-Friday: Radio Slovakia International – Bratislava, Slovakia Saturday: United Nations Radio: <i>World in Review and Scope</i> Sunday: <i>Network Plus and Health Watch</i>
2100	YLE Radio Finland – Helsinki, Finland
2130	Radio Sweden – Stockholm, Sweden
2200	Radio Prague – Prague, Czech Republic
2230	Radio Austria International – Vienna, Austria
2300	Polish Radio – Warsaw, Poland
2330	Radio Budapest – Budapest, Hungary

WRN Two Multi-Lingual to North America

Galaxy 5, 125 degrees West, transponder 6 (TBS) 3.820 GHz, V-Polarization, Audio subcarrier 6.2 MHz. Note that some programs listed below are subject to pre-emption without notice. All times are U.S. Eastern Time.

ET	Station
0000	World Radio Network from National Public Radio

0600	YLE Radio Finland – Helsinki, Finland (News in Finnish). On Saturdays a phone-in for children in Finnish until 0630.
0610	YLE Radio Finland – Helsinki, Finland (Easy listening music with announcements in Finnish and English)
0630	YLE Radio Finland – Helsinki, Finland (News of the past 24 hours in Finnish)
0700	Interval signal
0800	Raidio na Gaeltachta (News in Irish)
0900	Radio Prague – Prague, Czech Republic (Programming in Czech)
0927	Interval signal
1000	YLE Radio Finland – Helsinki, Finland (Regional broadcasts from various parts of Finland in Finnish)
1030	YLE Radio Finland – Helsinki, Finland (News in Finnish)
1100	YLE Radio Finland – Helsinki, Finland (Variable programming in Finnish – often light music)
1200	Radio Prague – Prague, Czech Republic (Programming in Spanish)
1300	Voice of Russia – Moscow, Russia (Russian Programming)
1400	Radio Vlaanderen International – Brussels, Belgium (Brussels Calling with Dutch programming)
1430	Identification tone
1630	Radio Austria International – Vienna, Austria (German Programming)
1700	Radio Budapest – Budapest, Hungary (Hungarian Programming)
1800	Polish Radio – Warsaw, Poland (Polish programming)
1830	YLE Radio Finland – Helsinki, Finland (Devotional programming in Finnish)
1855	YLE Radio Finland – Helsinki, Finland (News in Finnish)
1900	YLE Radio Finland – Helsinki, Finland (News of the past 24 hours in Finnish)
1925	YLE Radio Finland – Helsinki, Finland (News in Swedish)
1930	YLE Radio Finland – Helsinki, Finland (French programming)
1945	YLE Radio Finland – Helsinki, Finland (Light music in Finnish)
2030	YLE Radio Finland – Helsinki, Finland (Easy listening music). Announcements partially in English. Saturdays a phone-in for children in Finnish
2100	YLE Radio Finland – Helsinki, Finland (Documentaries and Theater of the Air in Finnish). Sunday: Classical music with a preview in English.
2200	YLE Radio Finland – Helsinki, Finland (English programming)
2230	Identification tone
	Friday: Voice of America <i>Communications World</i> – Washington, DC USA
2300	Interval signal
2330	Radio Austria International – Vienna, Austria (German programming)

WRN One English to Europe

Astra 1B, 19 degrees East, transponder 22 (VH-1) 11.538 GHz, V-Polarization, audio subcarrier 7.38 MHz. All programs in English and WRN program information can be heard daily at 0125 and 2025 UTC. Program information is also available on VH-1 Text page 222, 223, 224. All times BST/UTC+1 Hour (for Central European Time add 1 hour).

BST	Station
0000	Radio Budapest – Budapest, Hungary
0030	Swiss Radio International – Berne, Switzerland
0100	Radio Australia – Melbourne, Australia
0130	Radio Sweden – Stockholm, Sweden
0200	Tuesday-Saturday: National Public Radio <i>All Things Considered</i> (repeat) Sunday/Monday: National Public Radio <i>Weekend All Things Considered</i>
0300	Tuesday-Saturday: Canadian Broadcasting Corporation <i>As It Happens</i> Sunday-Monday: Radio Canada International – Montreal, Canada (World News and Features)
0400	Polish Radio – Warsaw, Poland
0430	Monday-Friday: Radio Budapest – Budapest, Hungary Saturday: Glenn Hauser's <i>World of Radio</i> Sunday: <i>The Way Ahead and New Horizons</i>
0500	Tuesday-Saturday: Public Radio International <i>Market Place</i> Sunday: Channel Africa – Auckland Park, South Africa Monday: Radio Denmark – Copenhagen, Denmark (Copenhagen Calling)
0530	Radio Austria International – Vienna, Austria
0600	Swiss Radio International – Berne, Switzerland
0630	Monday-Friday: Radio Canada International – Montreal, Canada <i>First Edition</i> Saturday: Radio Canada International – Montreal, Canada (World News and <i>Venture Canada</i>) Sunday: Radio Canada International – Montreal, Canada (World News)

SATELLITE RADIO GUIDE



INTERNATIONAL SHORTWAVE BROADCASTERS / SCPC SERVICES

- and *The Mailbag*)
 0700 Tuesday-Saturday: National Public Radio *All Things Considered* (repeat)
 Sunday/Monday: National Public Radio *Weekend All Things Considered* (repeat)
 0800 Radio Australia – Melbourne, Australia
 0900 Monday-Friday: Voice of Russia – Moscow, Russia
 Saturday: Glenn Hauser's *World of Radio*
 Sunday: Adventist World Radio
 0930 Monday-Friday: Radio Canada International – Montreal, Canada
 Saturday: Voice of America *Communications World* – Washington, DC USA
 Sunday: *Network Plus & The Way Ahead*
 1000 Radio Prague – Prague, Czech Republic
 1030 Monday-Friday: Radio Vlaanderen International – Brussels, Belgium (Brussels Calling)
 Saturday: *This Way Out*
 Sunday: Kol Israel – Jerusalem, Israel
 1100 Monday-Friday: Swiss Radio International – Berne, Switzerland
 Saturday: National Public Radio *Car Talk*
 Sunday: Public Radio International *Prairie Home Companion*
 1130 Monday-Saturday: Channel Africa – Auckland Park, South Africa
 1200 Monday-Friday: National Public Radio *Morning Edition*
 Saturday: National Public Radio *Fresh Air*
 Sunday: Public Radio International *Prairie Home Companion* (continued)
 1300 Monday-Friday: National Public Radio *Morning Edition*
 Saturday/Sunday: National Public Radio *Weekend Edition*
 1400 Monday-Friday: Radio France International – Paris, France
 Saturday/Sunday: Radio Memphis
 1500 Monday-Friday: Channel Africa – Auckland Park, South Africa (Repeat)
 Saturday: *Network Plus & New Horizons*
 Sunday: Radio New Zealand International – Wellington
 1530 Adventist World Radio
 1600 Radio Australia – Melbourne, Australia
 1700 Monday-Friday: Caribbean Tempo from CANA Radio/Vatican Radio – Vatican City (World News)
 Saturday: Radio Denmark – Copenhagen, Denmark (Copenhagen Calling)
 Sunday: *This Way Out*
 1730 Radio Austria International – Vienna, Austria
 1800 Monday-Friday: Radio Slovakia International – Bratislava, Slovakia
 Saturday: United Nations Radio: *World in Review and Scope*
 Sunday: *Norden This Week and Health Watch*
 1830 Radio Telefis Eireann (RTE) – Dublin, Ireland (News and Sports)
 1900 Radio Vlaanderen International – Brussels, Belgium (Brussels Calling)
 1930 Monday-Friday: Kol Israel – Jerusalem, Israel
 Saturday/Sunday: Radio Memphis
 2000 Monday-Friday: Radio Budapest – Budapest, Hungary
 Saturday/Sunday: Radio Memphis (continued)
 2030 Radio Sweden – Stockholm, Sweden
 2100 YLE Radio Finland – Helsinki, Finland
 2130 Polish Radio – Warsaw, Poland
 2200 Voice of America – Washington, DC USA
 2300 Monday-Friday: Public Radio International *The World*
 Saturday/Sunday: National Public Radio *All Things Considered*

Single Channel Per Carrier (SCPC) Services

By Robert Smathers
 roberts@nmia.com

An SCPC transmitted signal is transmitted with its own carrier, thus eliminating the need for a video carrier to be present. Dozens of SCPC signals can be transmitted on a single transponder. In addition to a standard TVRO satellite system, an additional receiver is required to receive SCPC signals.

The frequency in the first column is the 1st IF (typical LNB frequency) and the second column frequency (in parentheses) is the 2nd IF (commercial receiver readout) for the SCPC listing. Both frequencies are in MHz.

GE-2 Transponder-Vertical 13 (C-band)

1178.70 (81.3) NASA space shuttle audio

GE-3 Transponder-Horizontal 13 (C-band)

1207.90 (52.1) Wisconsin Voice of Christian Youth (VCY) America Radio Network–religious programming
 1204.25 (55.75) Wisconsin Voice of Christian Youth (VCY) America Radio Network–religious programming
 1204.00 (56.0) SRN (Salem Radio Network) News
 1201.50 (58.5) Wisconsin Voice of Christian Youth (VCY) America Radio Network–religious programming

1201.30 (58.7) Wisconsin Voice of Christian Youth (VCY) America Radio Network–religious programming
 1189.60 (70.4) Praise Broadcasting Network – religious
 1189.90 (70.1) Occasional audio
 1190.30 (69.7) Praise Broadcasting Network – religious

Galaxy 6 Transponder 1-Horizontal (C-band)

1443.80 (56.2) Voice of Free China (International Shortwave Broadcaster) Taipei, Taiwan
 1443.60 (56.4) KBLA-AM (1580) Santa Monica, CA–Radio Korea
 1443.40 (56.6) Voice of Free China (International Shortwave Broadcaster) Taipei, Taiwan
 1438.30 (61.7) WWRV-AM (1330) New York, NY–Spanish religious programming and music, ID–Radio Vision Christiana de Internacional

Galaxy 6 Transponder 3-Horizontal (C-band)

1404.80 (55.2) KOA-AM (850)/KTLK-AM (760) Denver, Colo–news and talk radio/Rockies MLB radio network
 1404.60 (55.4) WGN-AM (720) Chicago, IL–news and talk radio/Cubs MLB radio network

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SINGLE CHANNEL PER CARRIER (SCPC) SERVICES

1404.40 (55.6)	Illinois News Network/W MVP-AM (1000) Chicago, IL—"ESPN Radio 1000"/White Sox MLB radio network	1383.70 (76.3)	Motor Racing Network (occasional audio) NASCAR racing	1005.50 (54.5)	Canadian Broadcasting Corporation (CBC) Radio-North (Yukon) service
1404.20 (55.8)	Tribune Radio Networks/Wisconsin Radio Network	1383.10 (76.9)	KIRO-AM (710) Seattle, WA-news and talk radio/Mariners MLB radio network	Solidaridad 1 Transponder 1-Vertical (C-band)	
1402.90 (57.1)	USA Radio Network	1382.60 (77.4)	Soldiers Radio Satellite (SRS) network-U.S. Army information and entertainment radio/Army college sports	1447.90 (52.1)	Antenna Radio Noticias
1402.70 (57.3)	WLAC-AM (1510) Nashville, TN-news and talk/Road Gang trucker program (overnight)	1382.00 (78.0)	Occasional audio	1447.60 (52.4)	Antenna Radio Noticias
1402.20 (57.8)	NorthWest Ag News Network - Agriculture info for the Pacific Northwest	1381.60 (78.4)	KEX-AM (1190) Portland, OR-news and talk radio/	1447.20 (52.8)	La Grande Cadena Raza
1402.00 (58.0)	Occasional audio	1381.40 (78.6)	Occasional audio	1447.00 (53.0)	XEMZA-AM 560, Manzanillo, Mexico
1401.80 (58.2)	For the People Radio Network with Chuck Harder - talk radio format	1381.20 (78.8)	KJR-AM (950) Seattle, WA- sports talk radio	Anik E1 Transponder 21-Horizontal (C-band)	
1401.50 (58.5)	Agrinet Ag info/USA Radio Network	1377.10 (82.9)	In-Touch-reading service	1036.70 (63.3)	In-store music
1399.00 (61.0)	Sports Byline USA/Sports Byline Weekend	1376.00 (84.0)	Kansas Audio Reader Network-reading service	1037.00 (63.0)	In-store music
1398.80 (61.2)	Talk Radio Network (TRN) - talk radio format	1370.10 (89.9)	WRVG-FM (89.9), Lexington, KY - blues music format	1037.50 (62.5)	In-store music
1398.50 (61.5)	Occasional audio	Galaxy 6 Transponder 4-Vertical (C-band)		SBS5 Transponder 2-Horizontal (Ku-band)	
1398.30 (61.7)	WSB-AM (750) Atlanta, GA- news/talk/Atlanta Braves MLB radio network	1376.00 (64.0)	Data Transmissions	1013.60 (80.4)	Wal-Mart in-store network
1398.00 (62.0)	Occasional audio	Galaxy 6 Transponder 6-Vertical (C-band)		1013.20 (80.8)	Wal-Mart in-store network
1397.80 (62.2)	Occasional audio	1347.00 (53.0)	WCRP-FM (88.1) Guayama, PR-Spanish language religious programming	1012.80 (81.2)	Sam's Wholesale Club in-store network
1397.50 (62.5)	Minnesota Talking Book Radio Network-reading service for the blind	Anik E2 Transponder 1-Horizontal (C-band)		1004.50 (89.5)	Wal-Mart in-store network
1397.10 (62.9)	Wisconsin Radio Network/Wisconsin college sports	1446.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio-North (Quebec) service	1004.00 (90.0)	Wal-Mart in-store network
1396.90 (63.1)	WMVP-AM (1000) Chicago, IL - "ESPN Radio 1000" - sports talk, White Sox MLB Radio Network	Anik E2 Transponder 7-Horizontal (C-band)		1003.60 (90.4)	Sam's Wholesale Club in-store network
1396.70 (63.3)	Radio America Network/Business News Network	1326.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio-North (Eastern Arctic) service	1003.20 (90.8)	Wal-Mart in-store network
1396.40 (63.4)	Georgia News Network (GNN)-network news feeds	Anik E2 Transponder 13-Horizontal (C-band)		RCA C5 Transponder 3-Vertical (C-band)	
1396.00 (64.0)	WHO-AM (1040) Des Moines, IA-talk radio/Iowa News Network	1206.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio-North (MacKenzie) service	1404.60 (55.4)	Wyoming News Network-network news feeds
1395.80 (64.2)	WTMJ-AM (620) Milwaukee, WI-talk radio/Brewers MLB radio network	1205.00 (54.5)	Canadian Broadcasting Corporation (CBC) Radio-Occasional feeds/events	1400.60 (59.4)	Learfield Communications
1395.60 (64.4)	WGST-AM/FM (640/105.7) Atlanta, GA ID Planet Radio-news and talk radio	Anik E2 Transponder 17-Horizontal (C-band)		1400.40 (59.6)	Learfield Communications/MissouriNet
1395.40 (64.6)	Michigan News Network-network news feeds/WPLT-FM (96.3) Detroit, MI - Alternative Music	1126.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio-North (Western Arctic) service	1400.20 (59.8)	Occasional audio
1395.00 (65.0)	Occasional audio	1125.50 (54.5)	Canadian Broadcasting Corporation (CBC) Radio-North (Newfoundland and Labrador) service	1400.00 (60.0)	Learfield Communications
1394.70 (65.3)	WJR-AM (760) Detroit, MI-news and talk radio/Michigan News Network/Tigers MLB radio network	Anik E2 Transponder 23-Horizontal (C-band)		1396.60 (63.4)	Kansas Information Network/Kansas Agnet-network news feeds
1394.30 (65.7)	Michigan News Network - network news feeds	1006.00 (54.0)	Societe Radio-Canada (SRC) Radio-AM Network	1396.40 (63.6)	Liberty Works Radio Network - talk radio
1385.40 (74.6)	WDUQ-FM (90.5) Pittsburgh, PA - Jazz format			1396.20 (63.8)	MissouriNet/St Louis Cardinals MLB radio network
1384.60 (75.4)	WDUQ-FM (90.5) Pittsburgh, PA - Jazz format			1396.10 (63.9)	MissouriNet
1384.40 (75.6)	KOA-AM (850)/KTLK-AM (760) Denver, CO-news and talk radio sports/Rockies MLB radio network			1395.90 (64.1)	Western Montana Radio Network/Red River Farm Network
1384.20 (75.8)	WSB-AM (750) Atlanta, GA - news/talk/Braves MLB radio network			1395.70 (64.3)	MissouriNet/Kansas City Royals MLB radio network
				1386.40 (73.6)	Learfield Communications
				1386.20 (73.8)	Radio Iowa/Iowa college sports
				1386.00 (74.0)	United broadcasting Network-talk radio
				1384.60 (75.4)	Capitol Radio Network
				1384.00 (76.0)	Occasional audio/ABC Direction Network-network news feeds
				1383.80 (76.2)	Stan Solomon show - talk radio
				1383.40 (76.6)	Capitol Radio Network
				1382.90 (77.1)	MissouriNet
				1382.50 (77.5)	Virginia News Network-network news feeds/
				1382.10 (77.9)	Learfield Communications/MissouriNet

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Multi-Satellite Reception with a Fixed Dish

OK, class, today we will be studying a little history. This year marks the 20th anniversary of a series of articles published in *Radio-Electronics* magazine which showed readers how to build a complete earth station for domestic broadcast satellite reception. Written by early satellite TV pioneer, Bob Cooper, the series explained how to build receivers and low-cost reflective antennas. If you have access to a good public library you should be able to read the back issues and learn how this was done.

While little of that original article is relevant today, there are some points worth revisiting. One interesting aspect of satellite antenna design is that the antenna is actually a small probe which is only the size of the wavelength of the microwave frequency and sits in the throat of the feed horn looking back at the parabolic reflector. It's the reflector, with its distinctive dish shape, which people confuse with the antenna. The parabolic reflector gathers the microwaves and focuses them on the feedhorn which is placed a certain distance from the bottom of the dish. A shallow dish has a higher f/D ratio (the ratio of the dish focal length to its diameter) than a deeper dish.

One early reflector design was a very shallow curve based on a spherical section of a parabolic reflector and called a "spherical" antenna reflector. A peculiarity of this design was that it was so shallow that the feedhorn was mounted as far as 15 or 20 feet away from the reflector on a post set in the ground. At first this may sound like a primitive, space-wasting design, but, on second glance it's an ingenious design which permits reception of multiple satellites without having to move the dish. This is done by placing a series of different feed horns at the precise focal point for reception of several satellites whose signals will be arriving and bouncing at different angles.

This design allows for reception of up to 40 degrees of the Clarke Belt. In today's satellite environment, where satellites are placed only 2 degrees apart, this could easily include the seven major cable satellites from Galaxy 9 at 123 degrees west to Satcom F1 at 137 degrees west. Here, one large spherical reflector and seven LNBFs (Low Noise Block down-converted Feedhorns) strategically placed in front of the reflector would be fed with RG-6 cable and connected to a seven position switch in the house hooked up to one receiver. This could



Photo Credit: Kaul-Tronics

A large, shallow dish is perfect for this project.

give you instant access to 168 analog satellite channels and hundreds of digital channels. No moving parts!

The design was later used in commercial applications for cable companies by manufacturers who built large spherical antenna reflectors with numerous feed horns attached along an arm which ran from one side of the reflector to the other. This ends up being cost effective for cable companies because one dish can "see" up to 14 satellites without the expense and maintenance (or space!), occupied by 14 separate dishes.

If you have a lot of time and want an interesting project for this summer, you might want to try building your own spherical (see *Radio-Electronics* Feb. '80, pp 47-52, 83). Or you could take advantage of modern satellite dishes available and put together a less complicated system. Usually, the more shallow the dish the higher the f/D (focal length to diameter) ratio. This is not desirable on a home system because such a dish will suffer from adjacent satellite signals leaking in and causing interference to the intended signal.

However, right now that's exactly what we're looking for. We need a dish which is big enough to bring in enough signal (gain) and yet shallow enough to be able to "see" two satellites at once. The two satellites have to be in the 16 to 20 watt output category and spaced 2 degrees apart.

Keep in mind that a dish in the 4 to 6 foot range would not work well on the edges of a satellite footprint, but would work well near the center of the footprint. I've done this with a 4.5-ft. dish with satisfactory results by posi-

tioning the dish so that it "sees" between Galaxy 9 (G9) and Galaxy 5 (G5) which are 2 degrees apart in the sky. The polarity of the transponders are opposite, meaning that channel one of G9 (The Outdoor Channel) is vertical while channel one on G5 (The Disney Channel East) is horizontal.

Now, by positioning the dish directly between the two satellites I can tune in The Outdoor Channel and, by merely reversing the polarity on the receiver, tune in The Disney Channel East. The trick is that you have to use a high-isolation LNBF with a low temperature noise figure (25 degrees) and it must be set up perfectly for this to work. You can't do this on a bigger dish because the beamwidth of the boresight is too narrow and you have to move the dish to get enough signal to see the adjacent satellite.

The neat thing is that it does work and it shows that the original home satellite design using a spherical antenna can still work today.

Mail Bag

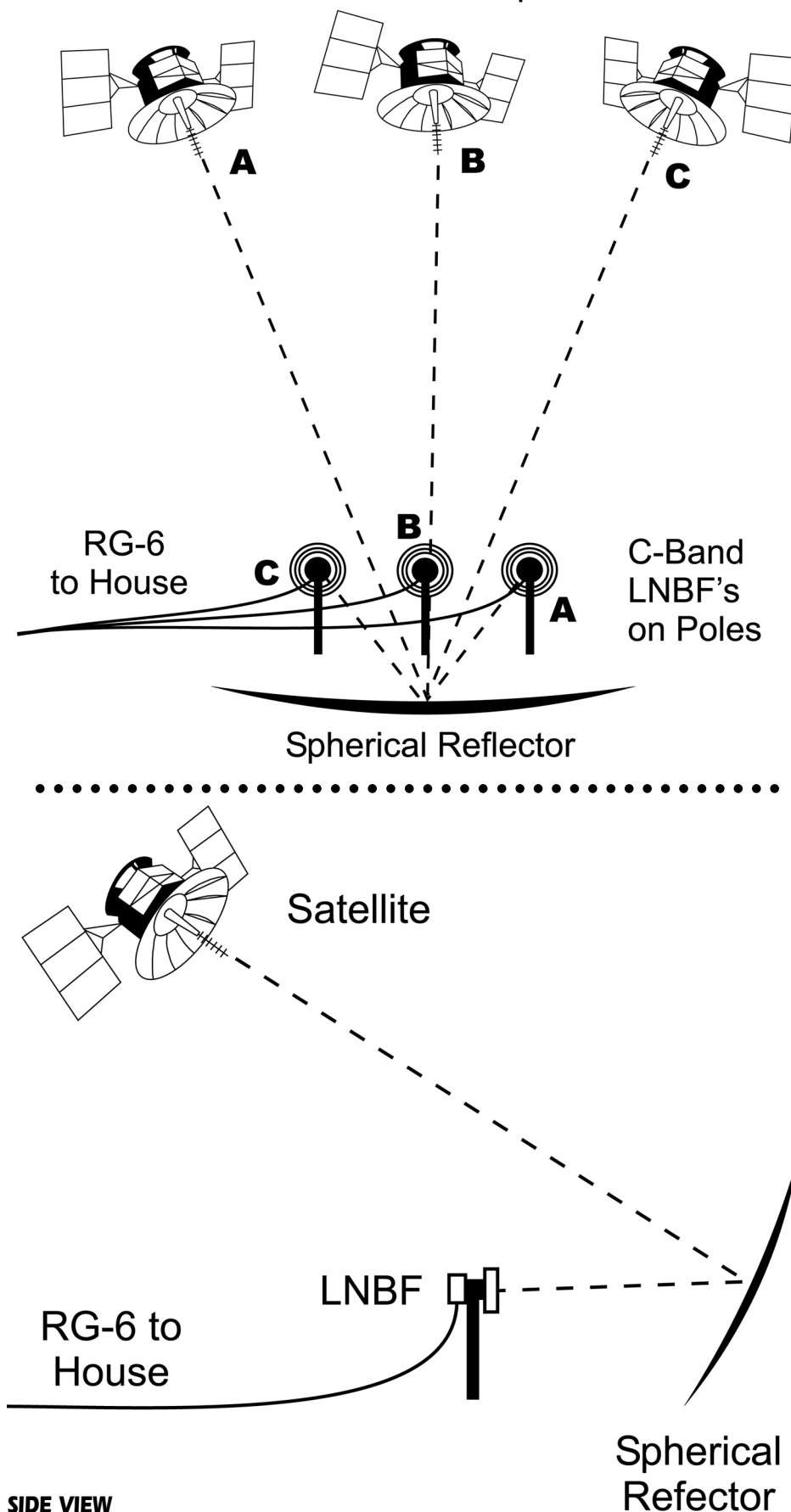
- Byron Hinton writes via e-mail that he would like to listen to shortwave broadcasters via satellite, especially BBC and to receive BBC television programming. He says he has "inherited" a Drake 1124 receiver with VideoCipher II Plus module installed and wants to know if this is enough to do the job or will he need a digital receiver as well. And, on a similar theme, Tony Dion writes that he has just returned to the States from England and would like to be able to get British and European TV and sports.

The best type of satellite gear is that which comes to you for free. Byron is lucky to have this system and it'll do just fine for receiving any analog video and audio channels.

- Theodore Lawryk of New York writes that he's not been sleeping well trying to imagine how TV broadcasts from Moscow can be seen on SBS 5 (Ku-band) which is at 123 degrees west and can't possibly be "seen" by a programmer in Russia.

Well, Theodore, it's no mystery. Russian programming is transmitted to the western hemisphere on Russia's Express 2 C-band satellite at 14 degrees west. This satellite is easily seen with a dish as small as 12 feet on the U.S. East Coast. The transmissions are made in the digital MPEGII mode and are uplinked to SBS 5 via programming on WMNB-TV,

Satellites 2 Apart



New York. They add their own local commercials, and the programming, intended for Russian expatriates in North America, is not scrambled, though the transmission is inverted compared with normal Ku-band transmissions.

To receive the signal turn the dish to SBS-5/Galaxy 9 (both co-located at 123 degrees west) and set the receiver to receive C-band (most receivers can switch between C and Ku-band via the remote control). If the switching is done automatically in the receiver, plug the Ku-band feed into the C-band jack and tune through the channels until WMNB appears.

- And, finally, Gerald Dehoney of Texas saw the listing in the SCPC services guide of *MT* for Soldier's Radio Satellite Network and wants to know how to receive this programming.

Yes, Gerald, Soldier's Radio Satellite Network is just one of dozens of radio feeds you can hear via satellite. As you look through the listing on pages 63 and 64 of *MT* you'll see many radio stations listed. These transmissions are analog SCPC (Single Channel Per Carrier) which are very narrowband audio services not tunable on a normal satellite receiver. You'll need an SCPC receiver such as Universal's SCPC-200 to tune them in (see my article in the March, '99 *MT* for full details).

For the most part these are "flagship" stations of various radio networks ranging from sports networks to news and talk radio networks. Many are big AM radio powerhouses such as WGN, Chicago; WSB, Atlanta; KIRO, Seattle; KEX, Portland; KOA, Denver, among others which are there to provide sports feeds for affiliated local stations. Here, throughout the year, you'll hear play-by-play broadcasts for many major league, minor league and college sports. There used to be easily three times the number of networks listed, but, most have gone digital and are available only on commercial digital SCPC receivers.

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Kit Building the Uncle Skip Way

Every now and again I get a letter or a piece of e-mail that asks the question, "Hey Skip... What do YOU like to do when you play radio?"

Well, if you've followed this column for awhile you know my tastes run rather eclectic. But even a radio sage such as myself doesn't have the time, talent and tax free income to do everything that radio has to offer at all times. I view the radio hobby like this big all-you-can-eat buffet; each time I go back to the buffet I tend to pick up a few different things to bring back to my table. So I might devote myself to heavy duty scanning for a number of months, then shift to SWLing or medium wave monitoring just to keep my interest level high.

But, like any buffet, every time I go back there are a couple of things I like *all* the time. One of these things is kit building. I got my start in the radio hobby assembling Heathkit equipment and, at last count, have worn out at least ten soldering irons over the years building electronic equipment, either as kits or "home brewing" right from schematics. Sometimes I've even experimented with my own designs. In all that the radio hobby as to offer, nothing is quite as exciting as monitoring or operating with a radio that you have built with your own hands.

You can clearly blame my current interest in kit building to my *Monitoring Times* colleague Rich Arland K7YHA. Over the years Rich has convinced me, through conversations and his writing, that low power (QRP) amateur radio is a lot of fun. Since I always enjoy communicating via ham radio, the additional challenge of QRP operating appealed to my competitive nature. Better yet, the QRP amateur radio community is a hotbed of homebrewing and kit building. So for the last year or so I have been melting a lot of solder, building great little transmitters and receivers that let me talk to folks all over the world at comparatively tiny power levels.

Kit building was certainly part of my beginner's experience, and I'm witness to the fact that beginners can have a lot of fun and learn a great deal from building their own radios. Heathkit may not make kits any more, but there are plenty of kits out there for a beginner to play with. As I said, nothing in the entire radio hobby compares to using a



Photo courtesy Dean Marzocco N2TNN and the New Jersey QRP Club

A collection of recent projects built by Uncle Skip N2EI.

piece of equipment you put together yourself, and the biggest surprise is discovering that assembling an electronic device is not that hard once you learn a few basic assembly techniques.

If you glance through the pages of just about any radio hobby magazine you are bound to find a few companies producing kits aimed at the radio hobbyist. Kits for receivers, transmitters, frequency converters, active antennas, power supplies and test equipment are all over the place. Many of these projects are inexpensive and just the thing to get a beginner rolling down the road to radio building bliss. The side-bar will clue you in to a list of kit dealers who can supply you with your first project.

Incidentally, as you peruse these folk's catalogs and web sites, you will probably notice that many of these kits are geared toward folks breaking into amateur radio. Nothing creates the incentive to pass your ham ticket quite like having a transceiver project three quarters done.

You don't need a ton of tools to get into kit building. The basics should keep you going for a long time. Start out with a pair of needle-

nosed pliers, a pair of diagonal cutters, a couple of screwdrivers and a small set of hex nut drivers. Most folks have these tools around the house already. All you need to add is a 25 or 30 watt soldering pencil, some rosin core solder, and a heat sink to protect delicate parts when soldering (although the needle-nose pliers will work in a pinch if you have someone to hold them while you are soldering).

If you need to purchase tools, remember, quality tools cost a bit more but they will last forever if you take good care of them. I have tools passed down to me by my great-grandfather that I still use almost every day.

When you get your first kit, the first thing to remember is . . .

■ Do Not Open the Box Yet!

You heard that right, Compadre. You have a couple of things to get done before you dare break the seal on that package. The reason I tell you to leave your future pride and joy in the box is that it is very easy to lose parts, making your kit fairly useless — sort of like a jig saw puzzle with that one missing piece,

only with a much more negative effect. One of the corollaries to Murphy's law indicates that the part you will lose is the one that will be on backorder for six months when you try to get a replacement. So hold off on spreading that kit out for the moment.

Even a very simple kit is going to take a long evening to assemble. Most projects will take you at least a few nights to finish. The key to success is to have a workspace that will remain completely undisturbed between assembly sessions. (The analogy about putting together a jigsaw puzzle still holds.) Once you spread things out you really don't want to put the pieces away every time you need to take a break. Wherever you plan to work, make sure everyone who shares your living space knows to keep their hands off the merchandise. Those of you with toddlers and cats will have to keep your project behind at least one door. Those of you with curious post-toddler children should let them join in the fun and help out.

If your project involves soldering (most do), you will need to work on a surface that can be splashed with hot liquid solder without causing a divorce. A good solution is to cover the work surface with a piece of scrap plywood or paneling.

■ Now Read the Manual

Now that you have your work area cleared and ready to go, finally you can open up that kit box. The first thing you will want to do is take out the assembly manual or instruction sheets and *read them!* Don't just glance over them; read them through. Most manuals will give you assembly hints and techniques that will make the project go a lot easier. You will also get a feel for logical stopping places if you have to break the work up over a couple of days.

The next thing you will want to do is find the parts list. Sometimes it will be a separate sheet of paper but often it is incorporated into the assembly manual (which you have already read, right?). Check to make sure that you have all the parts required to get the job done. If anything is amiss, get on the phone to the supplier and get the right parts shipped out. It is usually not a good idea to start without all the parts because most kit manuals are set up to install components in a particular order so you can't "work around" a missing part.

More complicated kits will be packed in a series of sub-assemblies. Once you have accounted for the parts in each individual sub-assembly, put everything back into the bag and seal that puppy up until you are ready to

go on to that section of the project. This will further cut down on the clutter and confusion.

One of the things that the old Heathkit manuals always suggested was to sort the parts into a cupcake pan. The individual cupcake "holes" keep the parts organized and prevent them from spilling on the floor. If you plan to make kit building a habit, you will want to buy your own workbench cupcake pan to avoid any friction in the family. After all, you don't want your carefully sorted components spilled all over your work surface because it's your significant other's turn to bring refreshments to the PTA meeting.

■ Soldering Skills

So now you're ready to start building. This is where you get to melt some solder. Soldering is not that hard a skill to master. You just have to do a few things in the right order.

- 1) Let the soldering iron warm up and then "tin" the tip with some solder.
- 2) Make sure the component has a solid mechanical connection at the terminal strip, printed circuit board trace or other component.
- 3) If you are soldering a transistor, integrated circuit or other semiconductor, place your heat sink between the component and the location you are soldering to draw heat away and prevent damage to the part.
- 4) Touch the hot soldering iron to a point where the component lead and whatever it is being soldered to meet and heat the connection.
- 5) While the soldering iron is still in place, touch the solder to the component lead and let it flow over the connection. Use enough solder to make a good connection, but not so much that it drips off or spills over onto other components or circuit board traces.
- 6) Remove the solder first and then the iron. A good solder joint should have a shiny surface. A dull or crystallized surface is a sign of a "cold" joint that could fail down the road.

If you are new to soldering, don't try to learn on your project. Go to an electronics store and buy a few cheap components (resistors are good). Twist the component leads together and practice soldering on these parts till you get the hang of it. It won't take long.

With soldering mastered, all you need to do is follow the directions and in the end you will have something to be really proud of. Most importantly, have fun!

LIST OF KIT SUPPLIERS

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HB Electronics

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(401) 487-5928
http://users.ids.net/~hb_elec/

Jade Products, Inc.

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603-329-6995
<http://www.jadeprod.com/>

Kanga US

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Findlay, OH 45840
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Oak Hills Research

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<http://www.ohr.com/>

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<http://www.ramseyelectronics.com/>

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Storms over Yugoslavia

Yet again, the weather in a particular region of the world has been making the news headlines; this time it was Kosovo in Yugoslavia. For some of NATO's operations, clear skies were required, but for several days from the end of March there was thick cloud cover. With a steady stream of weather facsimile images from Meteosat-7, I produced a sequence of animated images to monitor the cloud movements around Yugoslavia. Weather systems constantly change and the clouds cleared a few days later.

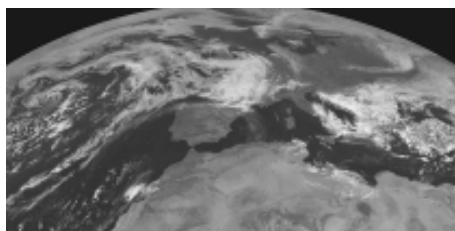


FIG 1: METEOSAT-7 Primary Data image April 3, 1202 UTC

Figure 1 is a high resolution image from Meteosat-7, captured just before the clouds over Serbia cleared. Primary Data (PD) images from Meteosat are available every 30 minutes for European monitors with decryption units, or every six hours for folk like me!

Freely available satellite-to-ground images are transmitted from NOAA-12, NOAA-14 and NOAA-15 in real-time. Each of these remained in full operation, enabling European monitors to obtain independent images of the region. Each National Oceanographic and Atmospheric Administration (NOAA) weather satellite carries full digital recording equipment that is routinely commanded for later data collection, so high resolution images of the region are available virtually continually.

The Defense Meteorological Satellite Program (DMSP) constellation obtains similar coverage, and in early April, I received a picture from Hank Brandli showing the region, as seen illuminated by moonlight, by a DMSP satellite. In this amazing picture – assuming my geography is up to spec – the lights of Belgrade (Yugoslavia) and Budapest (Hungary) can be clearly seen, together with many other cities and towns in this region of Europe.



FIG 2: DMSP picture of Europe by moonlight on April 1 at 1900 UTC from Hank Brandli, courtesy USAF

Hank has become a regular contributor to this column, providing unique images from DMSP satellites. His previous contributions include a satellite's view of an aurora, and locations around the globe responsible for levels of light pollution.

■ Operational Weather Satellites

Following the frequency change by Meteor 3-5 from 137.85 MHz to 137.30 MHz, weather satellite monitors around the world have been able to choose which satellite they wished to decode – on those occasions when the two are above the horizon together. Their orbits are such that the plane of Meteor 3-5's orbit slowly precesses, while Resurs 1-4 is almost sun-synchronous.

Having slightly different orbital periods – Resurs' period is about 8 minutes shorter than Meteor 3-5's – the difference rapidly brings the two spacecraft into and then out of phase every week or so. As on April 9, I had not received any signal from Meteor 3-5 for some hours, although as far as I am aware, no interruption to transmissions has been scheduled.

Europeans have received more images from Okean-4 and Sich-1. Several passes over western Europe included short transmissions, during one of which I obtained about two minutes of data – but not enough

to include here! Living on a hill, my antenna is shaded from the east; satellites must reach at least nine degrees elevation. Many transmissions from Okean only occur during low elevation easterly passes.

■ NOAA-15 Channels 3A and 3B

NOAA-15 (previously K) was launched in May 1998, and was the first in the new generation to carry enhanced equipment. Previous NOAA weather satellites (specifically NOAA-12 and NOAA-14) are still operating – as any person monitoring the 137 MHz band knows. These earlier craft carry the Advanced Very High Resolution Radiometer (AVHRR/2) that produces five channels of image data for transmission as high resolution picture telemetry (HRPT).

NOAA-15 carries an enhanced version – the new instrument (called AVHRR/3) having a sixth channel in the near-infrared, at 1.6 μ m (micrometers). This is referred to as channel 3A; channel 3B corresponds to the previous channel 3 on the AVHRR/2 instrument. The operational scheduling of channel 3A/3B switching is posted on the NOAA/SIS web site given in this article.

On 9 March (orbit 4257), NOAA-15 began transmitting AVHRR channel 3A data. Transmissions from channel 3A are not continuous, but are shared with channel 3B data transmissions each day. Channel 3A is toggled on during daylight passes only, as the spacecraft crosses the terminator into daylight. Additionally, 3A data is toggled on only when the spacecraft sub-point is north of 40 degrees N.

There will therefore be no low latitude northern hemisphere or any southern hemisphere channel 3A data transmissions. When the spacecraft is on descending orbit, channel 3A will be toggled off, and channel 3B toggled on south of 40 degrees north. Automatic Picture Transmission (APT) users will receive the AVHRR/3 channel 3A the same as channel 3B, with an identification wedge equivalent to grey scale wedge 3.

■ NOAA APT calibration markers

“Gray scale wedges?!” For the benefit of those who have recently entered the world of weather satellite monitoring, a few notes

about the amount of information actually included in NOAA image formats may be in order.

Even the most casual examination of NOAA APT images – see figure 4 – shows the minute markers that run continuously along one side of both frame sections. Each comprises two white lines, and a perceptive ear can distinguish the markers after a little practice, because of the temporary change in sound during these two lines.

By “sound” I mean the signal heard from an APT receiver’s speaker; this is the audio signal that is extracted when the receiver detects the 2.4 kHz modulation carried by the main 137.62 MHz signal. Many image characteristics can be deciphered by an experienced ear!

On the other side of each frame is a set of calibration levels – a sequence of shaded rectangles – see figure 3. These wedges, or blocks, are shaded from darkest to lightest, differing by fixed amounts. The first five represent channels 1 to 5; block 9 is black, representing zero modulation. Blocks 10 to 15 correspond to calibrated grey levels, and block 16 shows the channel in use for that image section.

Match this gray level (block 16) to the corresponding block in the calibrated group (blocks 1 to 5), and this number gives the channel in use. Look carefully at images taken during a channel change (for example some NOAA-12 evening images, and summer night images) and the change in wedge gray level will be seen. Clever eh?



FIG 3: Calibration wedge on NOAA APT images.

■ NOAA-15 data drop-outs monitored

Several users of HRPT from NOAA-15 reported data drop-outs in early April. A problem was identified with the S-band (1698.0 MHz) HRPT transmission. NOAA immediately became aware of the problem. According to Wayne Winston, a NOAA meteorologist, this particular transmitter/antenna had not performed to specification since launch. The problem has worsened, and NOAA believes it may also be related to the present Channel 3A/3B switching on the AVHRR. The problem also seems to be more apparent on the morning descending (south-bound) orbit.

NOAA continues to investigate and may temporarily stop 3A/3B switching as a test

for several days. Ultimately, the HRPT transmission may have to be switched to another transmitter/frequency. Updates will be posted to the “Bulletins” page of the NOAA/SIS web site:

<http://140.90.207.25:8080/noaasis.html>

My thanks to Wayne, NOAA/NESDIS Meteorologist, for this update.

■ Correspondence

Evidence of the international nature of the circulation of *Monitoring Times* was seen again when I received a disk from M and Mme Gerard Broc of Les Vezias, Grospierres, France. They have been monitoring passes from NOAA-14 and sent figure 4, the north-bound pass over France during the afternoon of 25 February. This date has a new significance to my family because our first grandchild was born on that day. My apologies to the correspondents for being unable to translate the notes provided on the disk, but the image was appreciated.

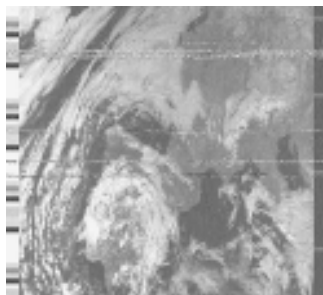


FIG 4: NOAA-14 visible-light image 25 February

■ Using NOAA data

The original purpose of launching weather satellites was essentially to enable weather forecasters to “see” what was coming over the horizon. One polar orbiting satellite provides up to three ascending and also descending passes (the terms refer to the satellite’s crossing of the equator) in each 24 hour period. By using thermal infrared, as well as visible-light sensors, meteorologists were able to study the movements of all types of weather systems regardless of day/night, so longer and shorter-term forecasting accuracy improved. Recent NOAA weather satellites carry significantly enhanced hardware as described previously.

Figure 5 is an HRPT image from the Operational Significant Event Imagery Support Team. It shows the central United States and a number of heat signatures (hot spots) and smoke (haze) from areas of fire burning in Kansas, Oklahoma and Missouri. The original multi-channel color composite shows

saturation of AVHRR channel 3 by solar reflection off the water, resulting in some rivers showing as a red color.

<http://www.osei.noaa.gov>

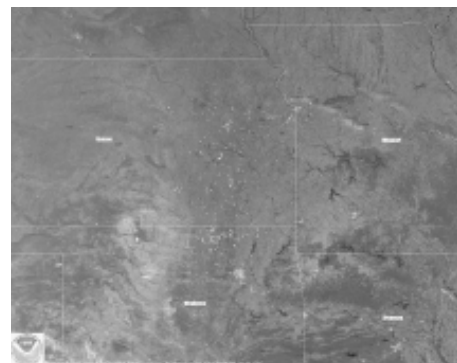


FIG 5: NOAA-14 HRPT 1 km resolution image April 6, 2033 UTC from the OSEIS Team’s Interactive Processing Branch.

FREQUENCIES

NOAA-14 transmits APT on 137.62 MHz
 NOAA-12 and -15 transmit APT on 137.50 MHz
 NOAAs transmit beacon data on 137.77 or 136.77 MHz
 Meteor 3-5 transmits APT on 137.30 MHz when in sunlight
 Resurs 1-4 transmits APT on 137.85 MHz
 Okean-4 and Sich-1 sometimes transmit APT briefly on 137.40 MHz
 GOES-8 and GOES-9 use 1691 MHz for weather facsimile

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Monitoring in Western Arkansas

The western part of the State of Arkansas is a beautiful area of the country with plenty of forest land to enjoy.

With forest land comes the US Forest Service and some interesting radio listening. Recently, *MT* reader John Maky (KD5EYV) passed along a report of the federal spectrum from his listening post in Parks, Arkansas.

John says most federal government law enforcement activity in Arkansas can be found on the State Trooper's 800 trunked system. He also says other activity heard in western Arkansas seems to be coming out of Tulsa/Oklahoma City. Oklahoma is in the process of installing their 800 trunked system so it's probably only a matter of time before the feds over there switch over to 800 MHz, too.

Here is John's list of western Arkansas federal government frequencies.

122.9250	US Forest Service tanker air-to-air
150.7750	NOAA weather radio Ft. Smith
	NEXRAD digital weathermode link.
162.0250	US Army Corps of Engineers recreation area maintenance repeater output
163.4125	US Army Corps of Engineers Administrative repeater output (164.775 input)
163.4375	US Army Corps of Engineers repeater output seldom used (165.1875 input)
165.2875	ATF repeater output (very distant activity)
165.2375	Customs repeater out with occasional DES heard (distant activity)
168.0250	Ouachita National Forest Law Enforcement "LE" simplex
	Ouachita National Forest Law Enforcement "LE" repeater output (172.325 input)
168.6250	US Forest Service Air Dispatch simplex
169.1750	Ouachita National Forest Net simplex channel 1
	Ouachita National Forest Net repeater output channel 2 (169.975 input)
169.6750	Ouachita National Forest Fire Net simplex channel 3
	Ouachita National Forest Fire Net repeater output channel 4 (170.500 input)



Typical hiking trail in the Ouachita National Forest in Arkansas. (USFS photo)

169.875	Unidentified repeater - interference keys up radio, but no traffic heard. Assigned to Ozark/St. Francis National Forest
169.9000	Ouachita National Forest Fire simplex tactical
171.5750	Ozark/St. Francis National Forest Net simplex channel 1
	Ozark/St. Francis National Forest repeater output channel 2 (172.375 input)
415.4250	Sycamore US Forest Service 169.175 repeater link
418.2250	USPS (Distant DES traffic)

Thanks for the great list, John; we will also carry his military frequency listings in the Milcom column next month, so stay tuned.

■ DEA in San Diego

Laura Quarantiello says that the DEA is alive and well and in the clear in **San Diego County**, California. The following frequencies were monitored during a surveillance recently: 418.175, 418.675 (channel 4), 418.750 (channel 3), 418.875, 418.975 (channel 7)

Thanks for the kind words, Laura, and please check in often.

■ Fed File Updates

Mike Agner in Baltimore, Maryland, heard from a contributor to his 2-meter net, who wishes to stay anonymous, with a little more info about the National Disaster Medical System (NDMS) that was featured in the last *Fed Files* column (April 1999).

According to Mike's source, the NDMS actually has both a fixed and a mobile repeater on 409.000 MHz (input 419.600) in the Baltimore area. The fixed repeater is supposedly not far from the Rockville area, and uses a private line (PL) tone of 100 Hz. The portable repeater also uses a PL of 100 Hz. Mike says that this frequency is used as a discrete and is not part of the 400 MHz trunk system in that area that seems to be getting more and more use lately.

Thanks, Mike, for passing that information along.

Another interesting report comes from Warren up in New York state. After some research and heavy duty monitoring he believes that the 163.125 MHz 131.8 Hz (PL) activity being heard in the New York City (NYC) area is by US Customs Internal Af-



Little Missouri River in the Ouachita National Forest (USFS photo)

fairs/Security division. He reports that they have an office on Long Island in Melville and an office in NYC. Thanks for the update, Warren.

■ MT's Government Master File

We continue our exploration of the VHF high, government frequency band, started in the December 1998 issue of the *Fed Files*. Today we profile the 165.0-165.9875 MHz range in Table 1. See you in two months for another edition of *MT's The Fed Files*, but until then, good hunting.

TABLE ONE: FEDERAL FREQUENCY ALLOCATIONS: 165-165.9875 MHz

165.0000	Interior Department (Nationwide) and National Science Foundation
165.0125	Air Force (Nationwide), Army (Nationwide), Corps of Engineers, Energy Department
165.0250	Air Force, Marine Corps
165.0375	Air Force (Nationwide), Army (Nationwide), Coast Guard (Transportation), Corps of Engineers, Forest Service (Region 8), Navy, Veterans Administration
165.0500	Army
165.0625	Air Force (Nationwide), Army (Nationwide), Corps of Engineers, Energy Department, National Institutes of Health (HHS)
165.0750	Army

165.0875	Air Force (Nationwide), Army (Nationwide), Corps of Engineers, Forest Service (Region 8), Veterans Administration		(Region 4), General Services Administration, Internal Revenue Service, Labor Department, National Park Service, Navy, Secret Service, United States Courts, Veterans Administration	165.6500	Fisheries Service (Commerce)
165.1000	Marine Corps			165.6625	Secret Service
165.1125	Air Force (Nationwide), Army (Nationwide), Corps of Engineers, National Science Foundation	165.4250 165.4375	(No reported activity)		Army, Federal Aviation Administration, FEMA (Nationwide), Housing and Urban Development (Nationwide), National Marine Fisheries Service (Commerce), National Science Foundation (Nationwide), Nuclear Regulatory Commission (Nationwide)
165.1250	Air Force		Air Force, Army, Customs, Energy Department, Environmental Research Lab (Nationwide-Commerce), FBI, Federal Aviation Administration (Transportation), FEMA, General Services Administration, Geologic Survey (Interior), National Marine Fisheries Service (Commerce), National Park Service (Interior), National technical Information Service (Commerce), National Weather Service (Commerce)	165.6750	(No reported activity)
165.1375	Air Force (Nationwide), Army (Nationwide), Coast Guard (Transportation), Navy		Coast Guard	165.6875	Bureau of Indian Affairs (Interior), Customs, Federal Aviation Administration, Secret Service (Nationwide)
165.1500	Air Force		Interior (Nationwide)	165.7000	Federal Aviation Administration and National Marine Fisheries Service (Commerce)
165.1625	Air Force (Nationwide), Army (Nationwide), Corps of Engineers, National Park Service (Interior)		Bureau of Reclamation (Interior), Census Bureau (Commerce), Customs, Energy Department, National Marine Fisheries Service (Commerce), National Weather Service (Commerce)	165.7125	Army, Bureau of Indian Affairs (Interior), Energy Department, FBI, Federal Aviation Administration, Labor Department, United Nations (State)
165.1750	Interior (Nationwide)		Air Force, Army, Customs, FBI, Geologic Survey (Nationwide-Interior), National Marine Fisheries Service (Commerce), National Ocean Service (Nationwide-Commerce), Secret Service	165.7250	(No reported activity)
165.1875	Air Force (Nationwide), Army (Nationwide), Coast Guard (Transportation), Corps of Engineers, Navy, Veterans Administration	165.4450 165.4500 165.4625	Federal Aviation Administration (Transportation)	165.7375	Air Force, Coast Guard (Transportation), Customs, Federal Aviation Administration
165.2000	(No reported activity)		Bureau of Alcohol, Tobacco and Firearms, Customs, Energy Department, FBI, Forest Service (Region 6), National Bureau of Standards (Commerce), National Marine Fisheries Service (Commerce), National Weather Service (Commerce)	165.7500	Federal Aviation Administration (Nationwide)
165.2125	Coast Guard (AK only-Transportation), Secret Service (Nationwide-Mike), WHCA (Nationwide-Mike)		(No reported activity)	165.7625	Customs, Federal Aviation Administration (Nationwide)
165.2250	(No reported activity)		Air Force, Army, Customs, FBI, Geologic Survey (Nationwide-Interior), National Marine Fisheries Service (Commerce), Secret Service	165.7750	(No reported activity)
165.2375	Coast Guard (Nationwide-Transportation), Customs (Nationwide), Environmental Protection Agency, Internal Revenue Service, National Marine Fisheries Service	165.4750 165.4875	Capitol Police, Energy Department, FBI, Federal Aviation Administration (Transportation), Institute for Telecommunications Sciences (Nationwide-Commerce), Geologic Survey (Nationwide-Interior), National Marine Fisheries Service (Commerce), National Weather Service (Commerce)	165.7875	Secret Service (Baker-Nationwide) and WHCA (Baker-Nationwide)
165.2500	Navy		(No reported activity)	165.7968	Low power, non-voice 5 kHz bandwidth splinter frequency (after January 1, 2005)
165.2625	Air Force, Coast Guard (Nationwide-Transportation), Energy Department, Federal Highway Administration (Transportation), Federal Railroad Administration (Transportation), Forest Service (Region 1), General Services Administration, Indian Health Service (HHS), Secret Service	165.5000 165.5125	(No reported activity)	165.8000	Low power, non-voice up to 11 kHz bandwidth splinter frequency (after January 1, 2005)
165.2750	(No reported activity)		Air Force, Army, Coast Guard (Transportation), Environmental Research Lab (Commerce), FBI, National Bureau of Standards (Commerce), National Marine Fisheries Service (Commerce), Veterans Administration	165.8031	Low power, non-voice 5 kHz bandwidth splinter frequency
165.2875	Bureau of Alcohol, Tobacco and Firearms (Nationwide)	165.5250	(No reported activity)	165.8062	Low power, non-voice 5-10 kHz bandwidth splinter frequency (until January 1, 2005)
165.3000	(No reported activity)	165.5375	Capitol Police, Energy Department, FBI, Federal Aviation Administration (Transportation), Institute for Telecommunications Sciences (Nationwide-Commerce), Geologic Survey (Nationwide-Interior), National Marine Fisheries Service (Commerce), National Weather Service (Commerce)	165.8093	Low power, non-voice 5 kHz bandwidth splinter frequency
165.3125	Air Force, Army, Coast Guard (Nationwide-Transportation), Energy Department, Federal Railroad Administration (Transportation), Maritime Administration (Transportation), Indian Health Service (HHS), National Park Service, Saint Lawrence Seaway Development Corp (Transportation)	165.5500 165.5625	(No reported activity)	165.8125	Low power, non-voice up to 11 kHz bandwidth splinter frequency (after January 1, 2005)
165.3250	Army and Customs		Air Force, Army, Coast Guard (Transportation), Environmental Research Lab (Commerce), FBI, National Bureau of Standards (Commerce), National Marine Fisheries Service (Commerce), Veterans Administration	165.8156	Low power, non-voice 5 kHz bandwidth splinter frequency (after January 1, 2005)
165.3375	Army, Bureau of Indian Affairs (Interior), Coast Guard (Nationwide-Transportation), Customs (Nationwide), Energy Department, Federal Aviation Administration (Transportation), Federal Railroad Administration (Transportation), Geologic Survey (Interior), Indian Health Service (HHS), National Institutes of Health (HHS), Secret Service	165.5750 165.5875	(No reported activity)	165.8250	Bureau of Prisons, FBI, Immigration and Naturalization Service (Nationwide)
165.3500	Army		Army, Energy Department, FBI (Nationwide), Maritime Administration (Transportation), National Marine Fisheries Service (Commerce), National Park Service (Nationwide), National Weather Service (Commerce)	165.8275	(No reported activity)
165.3625	Secret Service (Nationwide)		Interior (Nationwide)	165.8500	DEA (Nationwide), Energy Department (Nationwide), FBI, Immigration and Naturalization Service (Nationwide), Secret Service, Veterans Administration
165.3750	Secret Service (Nationwide-Charlie) and WHCA (Nationwide-Charlie)	165.6000 165.6125	Air Force, Environmental Research Lab (Commerce), Federal Aviation Administration, NASA, National Marine Fisheries Service (Commerce), United Nations Security (State)	165.8625	(No reported activity)
165.3875	Secret Service (Nationwide)		Federal Aviation Administration, NASA, Navy	165.8750	Bureau of Prisons, FBI, Immigration and Naturalization Service (Nationwide)
165.4000	(No reported activity)		Customs, Federal Aviation Administration (Nationwide), National Marine	185.8875	(No reported activity)
165.4125	Air Force, Army, Bureau of Prisons (Justice), Bureau of Reclamation (Interior), Coast Guard (Transportation), Customs, Energy Department, Environmental Protection Agency (Nationwide), FBI, Forest Service	165.6250 165.6375		165.9000	FBI, Immigration and Naturalization Service (Nationwide), Secret Service
				165.9125	(No reported activity)
				165.9250	Bureau of Prisons, FBI, Immigration and Naturalization Service (Nationwide), National Park Service
				165.9375	(No reported activity)
				165.9500	Customs, FBI, Internal Revenue Service (Nationwide)
				165.9625	(No reported activity)
				165.9750	Bureau of Land Management, Customs, FBI, Immigration and Naturalization Service (Nationwide), Interior Department, National Park Service
				165.9875	(No reported activity)

A Toast to Air Traffic Controllers

Welcome aboard, everyone! The following poem caught my eye on the web. It was composed by Bridget Scarbrough, who is married to an air traffic controller and kindly gave her permission for it to be reprinted in this column:

Air Traffic Controllers Acclaim

With nerves of steel
And a willful mind
You tend to stick with your own
kind
Independent and proud
With a renegade streak
Your job is not for the timid and
weak
Technically superb
A lifeline to the sky
But often unknown to people who
fly
You don't wave a flag
You don't carry lights
You do so much more than clear
us for flight
Aggressive and unshaken, your
intentions are clear
Confident in your decisions, you
are without fear
You're not often thanked for the
service you provide
But unspoken appreciation cannot
be denied
Your voice and technique may be
your only fame
AIR TRAFFIC CONTROLLER... Your
profession by name

Thanks, Bridget! Another person, Kristina H., was an air traffic controller in the army and she has written a lively description of air traffic control (ATC) and how it all works together. Kristina has given her permission for us to use it in "Plane Talk":

"Air Traffic Control? Wow, that must be stressful!"

"I hear the above a lot, mostly from non-air-traffic controllers. If you're working at O'Hare or LAX (Los Angeles Int'l) or a similarly busy airfield, you're probably going to be under a lot of stress. If you're at Pogonip Airport and Grill, you'll probably



Photo by Bob Wyman

have trouble staying awake. The most stressful part about ATC, I think, is that we feel responsible even if there's nothing we could do. If the computers go down and someone crashes, it doesn't make us feel any better to

think, "Oh, well, the computers were down. That's the way it goes."

You do have to be pretty focused on what you're doing, especially if it's busy. Doing ATC in Korea was pretty interesting since the

ROK pilots sometimes wouldn't listen to us and we had to make do with warning off the other aircraft. "Page Tower to Army 346, be advised, we have no idea what that ROK (Republic of Korea) OH-58 is doing. Maintain separation." That always looks good on a flight recorder...

ATC involves a bunch of things, but it's mostly having a couple of books of procedures committed to memory more or less verbatim. Here's a bit of a breakdown on some of the things ATC's do:

■ At the Airport

At the airport itself, you usually have three main ATC guys: Local Control, Ground Control, and Flight Data. Local control is responsible for aircraft on (you guessed it) the ground, including all the taxiways but not the runways themselves. The Flight Data guy keeps track of a bunch of stuff like the weather, aircraft IDs and other important information.

That's pretty simplistic, but you get the idea. Ground control and local control have to work together to make sure that one doesn't taxi across an active runway when someone's trying to take off. In fact, if Ground needs to take someone across one active runway to another one, she needs to get permission from Local first just to avoid any mishaps.

A friend of mine was once working Flight Data when there was a massive collision of two aircraft on one of the runways ... he's never been the same since.

■ The Radar Guys

Outside the tower (but sometimes in the same building) there are a bunch of people who take care of aircraft that are farther away. They use radar and various instruments to keep track of flight paths, altitudes, vectors, etc. It's a bit strange to work in a radar room, especially after working in a tower, because you can't see the aircraft. Oh sure, you "see" them on your screens, but it's still a little strange at first.

Once a plane leaves the ATA (airport traffic area), "Local" hands it over to the radar guys who follow it out farther than the naked eye can see. There's a lot more to it than this, but it has to do a lot with words like "squawk" and other arcane bits of phraseology I'll leave alone. Besides, it's been a few years and I was pretty much a tower gal. I wouldn't want to embarrass myself ...

■ Air Route Traffic Control Centers

It's easier to think of ATC as a big net

consisting of little concentric circles. Local control is in charge of the area around the airport, then he hands you off to Approach (Departure) Control, who then hands you off to the Air Route Traffic Control Center.

The ARTCC ... (Please note that we say that as the letters. We don't call it an "Artsy"; if you did when I was in school, they'd whop you upside the head)... has a very large area of responsibility, usually over a couple of states or more.

They also use radar, but they really have to have a smashing good memory of their airspace and where everything is. If some pilot gets lost and says "There's a Denny's and a blue kid's bike parked below me," some of these ARTCC people can tell the pilot where to go from there.

You think I'm kidding? In ATC school one of our tests was to draw a map of a 50-mile radius area from scratch directly from memory. Well, okay. Perhaps I exaggerate, but only slightly.

■ Flight Service Stations

I always kind of grin when I think of the Flight Service Stations (FSS). It puts me in mind of a big gas station floating around in the air. But no, it's another part of ATC.

The FSSs put together reports on weather and other conditions and make them available to the pilots. They act in an advisory capacity, and don't actually control anything. They provide a necessary service, but I'd have to go back and read up on all the stuff they do.

■ Final Note

A guy down at the FAA headquarters told me once that the whole stress thing was made up by the ATCs so that they could get more money. Maybe, and maybe not. The fact is that budget cuts have ATC's working harder and stretching farther than ever. Add that to the enormous amount of responsibility that's placed on them, and you've got stress in the making.

I would like to say that the ATCs who work for the Federal Aviation Administration (that is to say, *all* ATCs) are extremely bright and hard working individuals for the most part. They go through some tough training and even tougher on-the-job stuff to get where they are, so think of them kindly."

Thanks, Kristina! That's it for this month. See you in July with more aero communications news and views.

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"Go 'n buy the book"

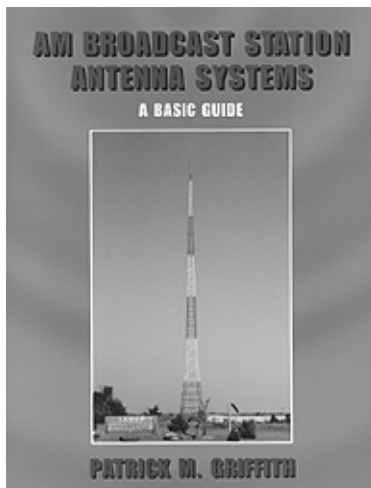
I've always felt a good reference library is critical to the domestic-band DXer. Unlike international stations, which are usually very proud of their identities and identify often, domestic stations seem to assume you know who they are. This is a reasonable assumption for their primary audience, but a serious pain for the DXer! Good reference books are critical for identifying one's DX. There have never been many (any?) books for the DXer that *weren't* references, but this month we have an interesting exception.

Regular *MT* contributor Patrick Griffith has written *AM Broadcast Station Antenna Systems - A Basic Guide*. The title of this book is really a bit misleading, as it goes well beyond the antennas themselves. The first chapter explains radio propagation — why we hear DX (and why we only hear it at night). The next two explain some of the Federal Communications Commission (FCC) regulations for AM stations. This information is valuable for the new DXer regardless of their interest (or lack thereof) in transmitting antennas.

Beginning in Chapter 3, Patrick gets down to business, explaining both the electrical and mechanical concepts governing AM transmitting antennas. Just about everything you might see at a transmitter site is explained. "Folded unipole" feeds, lightning chokes, top-loading devices, "sectionalization," and detuning of other towers are all discussed. Finally, the book ends by touching on the subject of DXing.

This is a well-illustrated book. If you've visited AM transmitter sites, you've probably seen everything in the pictures — but unless you're a radio engineer, you probably don't know what a lot of things are, or why they're present. The captions will answer your questions. I can definitely recommend this publication, especially to the beginning DXer. The cover price for this 65-page book is \$15.95; it's available from the National Radio Club (more on them in a moment), or from Universal Radio. There's also a web site, <http://www.angelfire.com/co/antenna>.

Carl Lefevre in New Jersey wrote "I remember an old publication entitled *White's Radio Log*. Could you tell me if you know whether it's still published?" No, *White's* has been out of print for several years now. The National Radio Club's *AM Radio Log* is an excellent substitute for the AM DXer; in fact, it's much more comprehensive than *White's*



Patrick Griffith's book is a good guide for the new DXer interested in some of the technology behind AM radio stations.

ever was.

The NRC offers a variety of other publications of interest to the AM DXer. You can get a copy of the *NRC Product Catalog* by sending a 33-cent stamp to Box 164, Mannsville NY 13661-0164. Or, visit <http://www.nrcdxas.org>. Don't forget to check out the article reprints; these can keep you reading for hours!

The *FM Atlas* is the standard guide for FM DXers. Word is now out that the 18th Edition is near completion — it should be available by the time you read this. This handy little book lists all U.S., Canadian, and Mexican FM stations, complete with slogans and programming formats, not to mention tower height and power. And as the name implies, there are maps of station locations.

■ Expanded Band News

Allen Renner of Pennsylvania sent a copy of his KCNZ-1650 verification letter. It would appear this station is receiving a lot of requests, as they prepared a form letter for responses, similar to the QSL cards that stations used to use. Most verifications I've received recently have been informal letters. If you've logged KCNZ-1650, the address is P.O. Box 248, Cedar Falls, IA 50613-0768. Allen's verification was signed by Greg Alan, Program Director.

I get a lot of mail from listeners, but every once in awhile I get something from a station. Mike Shannon, Operations Manager at

WHLY-1620 (and its regular-band cousin, WJVA-1580) wrote after reading my mention of his station in the February issue of *MT*. Since I wrote the February article, the two stations swapped callsigns — the 1620 station had been signing WJVA and 1580 as WHLY. They also broke off their simulcast; WHLY-1620 kept the middle-of-the-road music format, while WJVA-1580 adopted a "classic country" format. Of course, the 1620 signal covers a fair part of the East, but the 1580 signal is also widely heard, especially with CBJ in Quebec moved to FM.

There have been other recent format and call changes in the expanded band. The first expanded-band station, 1660 in Elizabeth, New Jersey, is now airing the Radio Unica satellite-fed Spanish-language format. The call letters have been changed to WWRU. Also adopting the Radio Unica format and changing calls are WCMQ-1700 Miami Springs, Florida, which is now WRNU.

Ben Loveless in Michigan has heard WHLY-1620. He also noted a format and call-letter change for WNML-1670 Warner Robins (Macon), Georgia. This station has dropped the all-sports format in favor of country music and the calls WRNC. On a totally different subject, Ben is looking for a replacement power switch for his SuperRadio I. Does anybody have any ideas where he can get one?

■ Bits and Pieces

The FCC has extended the date for comments on the Low Power FM (LPFM) proposal to June 1. If you act *real* fast, you might be able to get something in on time.

The Pacific Northwest has always been very tough to log from anywhere in the East, but a couple of DXers have made an exotic logging from this area with CBF-690 Montreal off the air. Two DXers in eastern Canada have had tentative reception of CBU-690 Vancouver, and two others (Jim Renfrew in Rochester, NY, and me, near Nashville) have positively identified this station. Listen for the CBC theme music (a visit to www.cbc.ca on a computer equipped for Real Audio could be valuable here) or for British Columbia weather.

Are you hearing from the Northwest this summer? Write me at Box 98, Brasstown NC 28902-0098, or by email to w9wi@bellsouth.net

Good DX!

Radio Free Berkeley Returns

According to station Spokesman Paul Griffin, **Radio Free Berkeley** returned to the air on April 11, and has been broadcasting irregularly since then to the San Francisco-Oakland Bay Area of California. They say that a daily schedule is planned "as soon as circumstances permit."

Stephen Dunifer's station is probably the best known micropirate broadcaster in the United States, so this is a situation of some significance. The broadcasts are being made despite a Federal Court injunction against the station. RFB indicates that they don't anticipate a license from the FCC "at any time in the near future," despite proposals still pending before the FCC for a low power USA FM broadcasting service.

Radio Caroline

Radio Free Berkeley is probably the most famous North American pirate operation, but **Radio Caroline** still holds that title in Europe. *MT* reader Michael Muehlbauer notes that their current programming is widely audible in Europe via the Astra 1C satellite direct broadcasting service. They are cryptic about plans to resume over the air transmissions, but if you'd like to check out the current situation at this classic Europirate, <http://www.radio-caroline.co.uk> provides information direct from the station.

Serbian Clandestines?

Aside from an intermittent Europirate relay on 11415 kHz of independent Belgrade FM station **B-92**, the conflict between NATO and Yugoslavia initially produced sparse shortwave clandestine radio activity. But, numerous sources and *MT* readers note that **B-92** has been clearly audible at <http://play.rbn.com/?b92> via internet RealAudio, although an April Serbian government crack-down on station management interrupted their live shows. Portions of this broadcast are in English. The RealAudio server gives situational updates, so it's worth checking out.

South American Pirates

Dr. Zaius notes an excellent logging of **Radio San Miguel El Faique**, a Peruvian pirate using 6987.1 kHz around 0230 UTC. The area between 6955 and 7000 kHz is a

good one to bandscan for South American pirates, which sometimes are heard reasonably well in North America. Good luck! **Radio Cochiguaz** at http://www.geocities.com/Area51/Shadowlands/4401/RC_EE.html or via Casilla 159, Santiago 14, Chile, is a good information resource for these stations.

Shortwave Pirate Activity

North American pirate radio stations heard by our readers last month all used frequencies within 500 kHz of 6955 kHz, typically from two or three hours before sunset until at least 0500 UTC. Morning and afternoon broadcasts increase on the weekends. Programming formats and contact maildrops (when known) are listed. Activity levels have been increasing in comparison to the lull created by FCC busts a few months ago.

Blind Faith Radio- Dr. Napalm hosts classic rock music. (Merlin)

Indira Calling- Vijay Nehru plays the latest hit parade from Calcutta. (Providence)

Jerry Rigged Radio- Rock and parody ads. (Providence)
KREZ, Free Radio America- A new one, also known as The Don, with rock and live studio banter, claiming to serve Chicago. (None)

Lounge Lizard Radio- Lounge music from bars located near homes of pirate DXers. (Providence)

Radio Bingo- The radio bingo game has a longer and more elaborate program; some MW licensed stations also host bingo games. (None; uses radiobingo@chek.com)

Radio Doomsday- Relays of Nemesis' creative old shows have materialized. (Providence)

Radio Metallica Worldwide- Dr. Tornado's 10 kW transmitter, heard literally worldwide, blasts out rock music and commentary. (Blue Ridge Summit)

Radio Tornado Worldwide- A clever parody of Metallica. (None)

RBCN- Radio Bob's Communications Network airs rock and originally produced comedy; Rainer heard them from Europe! (Lula)

Scorch Radio- Hard rock music dominates here. (None; uses scorch_radio@hotmail.com)

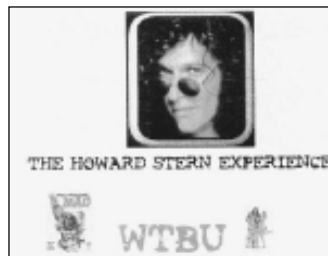
Voice of Bizzaro World- All programming is backwards on this odd one. (Huntsville)

Voice of Pancho Villa- Pancho rematerialized with DX comedy in mid-March as usual. (Blue Ridge Summit)

Voice of Prozac- I got one of their relaxing t-shirts at the Kulpville Winterfest. (Pittsburgh)

WACK- A slick rock music outlet with professional production values; Ranier heard them in Europe! (None; announces a toll free phone number for oral reports)

WHYP- A memorial to upstate NY radio legend James Brownyard, with local weather. (None, uses whyp1530@hotmail.com)



WKND- Radio Animal promotes rock, the pirate scene, and dogs. (Blue Ridge Summit)

WLIS- Jack Boggan with the world's only SWBC interval signal station. (Blue Ridge Summit)

WMFQ- Rock music, parodies, and promotion of QSL's are their focus. (Providence)

WMPR- A mysterious techno rocker, generally with good signals. (Still None)

WPN- Captain Squirtlong's World Parody Network is accurately named. (Huntsville)

WSRR- Dr. Love mixes rock and soul music with relays of ancient radio shows. (Belfast)

WTBU- The Howard Stern Experience confirmed its call letters with the QSL we see here this month. (Providence)

WRX- Despite FCC displeasure, Jimmy the Weasel is still occasionally heard. (Manomet)

WWRX- The parody of Jimmy the Weasel appears whenever hints of the real Jimmy materialize. (None, uses wrrx@hotmail.com)

Reception reports to pirate stations require 3 first class stamps for USA maildrops or \$2 US to foreign addresses. Send your letters to PO Box 1, Belfast, NY 14711; PO Box 28413, Providence, RI 02908; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 25302, Pittsburgh, PA 15242; PO Box 11522, Huntsville, AL 35814; PO Box 24, Lula, GA 30554; PO Box 1464, Manomet, MA 02345; and PO Box 293, Merlin, Ontario N0P 1W0.

Thanks!

Your input is always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address atop the column. We appreciate material sent in this month by Shawn Axelrod, Winnipeg, Manitoba; Jerry Berg, Lexington, MA; Radio Bob, Lula, GA; Ranier Brandt, Hoefar, Germany; Jerry Coatsworth, Merlin, Ontario; Ross Comeau, Andover, MA; Joe Filipkowski, Providence, RI; Ullis Fleming, Glen Burnie, MD; Harold Frodge, Midland, MI; Paul Griffin, San Francisco, CA; William Hassig, Mt. Prospect, IL; Ed Kusalik, Coaldale, Alberta; John Jenkins, Charleston, WV; Zacharias Liangas, Italy; Chris Lobdell, Stoneham, MA; Ben Loveless, Bloomfield Hills, MI; Greg Majewski, Oakdale, CT; Jonathan Marks, Hilversum, Netherlands; Cachito Marmani, Santiago, Chile; Bill McLintock, Minneapolis, MN; Michael Muehlbauer, Aachen, Germany; Dick Pearce, Brattleboro, VT; Mike Prindle, New Suffolk, NY; Al Quaglieri, Albany, NY; Craig Pradarelli, Necedah, WI; Martin Schoech, Merseburg, Germany; Lee Silvi, Mentor, OH; Joe Singleton, Houston, TX; Richard A. Sklar, Seattle, WA; DJ Stevie, Basel, Switzerland; Niel Wolfish, Toronto, Ontario; Dr. Zaius; and David Zantow, Janesville, WI.

Ham Band Update

It appears that we are closer than ever to achieving two longwave ham bands — one at 160-190 kHz and another at 136 kHz. The matter is currently under review by the Federal Communications Commission (FCC) and the results should be known soon. In the meantime, look for some new signals to appear around 136 kHz, as discussed in Bulletin ARLB016 from the American Radio Relay League (ARRL). The text of the bulletin follows:

"The FCC has granted a one-year experimental license to the Amateur Radio Research and Development Corporation — AMRAD — to conduct tests on 136.75 kHz. Experiments would be carried out from 12 Northern Virginia sites using the call sign WA2XTF to gain low-frequency experience in anticipation that the FCC may allocate an amateur band at 136 kHz.

"Emissions authorized for these tests include 173-Hz and 450-Hz bandwidth frequency-shift data and 100-Hz bandwidth CW. The authorized transmitted power is 1 watt effective radiated power (ERP). The 12 stations will operate experimental transmitters, antennas and receiving systems using digital signal processing techniques.

"Participating in the experimental operation are Glenn Baumgartner, KA0ESA; David Borden, K8MMO; Robert Bruhns, WA3WDR; Hal Feinstein, WB3KDU; Terry Fox, WB4JFI; Andre Kesteloot, N4ICK; George Lemaster, WB5OYP; Shannon Mishey, N8TBM; Paul Rinaldo, W4RI; David Rogers, K9RKH; Elton Sanders, WB5MMB; and John Seely, AA4GM. Rinaldo is the ARRL's technical relations manager.

"While the list of stations is closed and new transmitting stations cannot be added, others are invited to join the project by listening and reporting results. Reception reports should be sent via e-mail to Andre Kesteloot, N4ICK, n4ick@amrad.org.

"Last October, the ARRL petitioned the FCC to create two amateur LF allocations at 135.7-137.8 kHz and 160-190 kHz. Several countries throughout the world already enjoy LF allocations around 136 kHz. These include New Zealand, Great Britain, the Republic of Ireland, and several European nations.

"Further information concerning these LF experiments will be available on the AMRAD

Web site, <http://www.amrad.org>.
—End of bulletin—

Listeners in or near Virginia might want to keep an ear to 136.75 kHz for these stations. It should be noted that members of the Longwave Club of America (LWCA) and others have been experimenting on the low frequencies since at least the early 1970's and have carried out numerous experiments in CW, voice, and data modes. Much of the credit for weak signal receiving techniques, antenna improvements, and interference reduction rightly belongs to these pioneers.

The new experiments will, however, help to bring low frequency knowledge into the main stream of amateur radio for practical application on the anticipated new bands. I'd like to encourage listeners to support AMRAD's experiments and confirm any signals that are heard.

■ Euro-Beacon Guide Update

For those interested in DXing beacons afar, Robert Connolly (GI7IVX) announces that he has released a new edition (1999) of his popular *European Beacon Guide*. It is available as a printed copy or on floppy disk as a 'txt' file. There are two available formats for floppy disk: 1.44mb, and 720kb for those with older machines. The price for any version is \$15 US and includes air mail postage.

Speaking of DXing beacons, Stephen P. McGreevy advises that the book: *On the Art of NDB DXing* is now available on the web at <http://www.triax.com/vlfradio/natradio.htm>. He is also in the process of placing an NDB beacon photo gallery on the site with links from the book pages.



Longwave monitoring post of Gordon Hullin (NY) includes restored National (left) and Hammarlund receiver.

SYF 386	
BEACON	KHZ
This will verify your	
Date: <u>January 21, 1996</u>	Reception of our beacon.
Freq: <u>386 KHz</u>	Verified by: <u>Robert Grace</u>
Time: <u>0427 UTC</u>	Title: <u>Dyes, Grace F/S, Inc</u>
Elevation: <u>450 feet</u>	Date: <u>1-29-96</u>
Power: <u>25 Watts</u>	Remarks: <u>Amazing!</u>
Location: <u>39°44'N 101°46'W</u>	
Antenna Type: <u>ST. Francis</u>	

Allen Renner (PA) received this fine QSL from the Engineer-in-Charge of SYF/386, St. Francis, KS.

■ Loggings (14-512 kHz)

This month's loggings are from Dick Pearce (VT). They represent some of Dick's best catches from late-winter '99, and the list includes several stations not commonly seen in longwave publications. Loggings of beacons or any stations below 530 kHz are most welcome in this column. Send your favorite picks to Below 500 kHz, P.O. Box 98, Brasstown, NC 28902. E-mail is also welcome at the address in the masthead.

Freq.	ID	Location
14	M	RUSSIAN
17	RLO	UNID
18.2	VTX3	VIJAYANARAYANAM, IND
206	GLS	GALVESTON, TX
210	UMO	MOA, CUBA
230	UCL	CAYO LARGO, CUBA
230	MUN	MATURIN, VEN
232	GT	GRAND TURK, BWI
236	GNI	GRAND ISLE, LA
256	UNV	NUEVAS, CUBA
257	SQT	MELBOURNE, FL
265	EDE	EDENTON, NC
269	MRH	BEAUFORT, NC
300	SM	SAO MARCOS, BRAZ
300	ABL	ABALEMA, COL
326	BHF	FREEMPORT, BAH
332	FIS	KEY WEST, FL
349	K	SANTIAGO, CUBA
362	GND	PT SALINES BWI, GREN
371	TOX	SILER CITY, NC
380	UCY	CAYOJABO, CUBA
382	UPA	PUNTA ALEGRE, CUBA
388	AM	TAMPA, FL
400	PIE E	BUCARAMANGA, COL
400	XW	FLEMINGSBURG, KY
402	C	CAMAGUAY, CUBA
405	RZZ	ROANOKE, NC
410	JU	JEFFERSON, NC
412	UNG	NUEVA GERONA, CUBA
412	MTU	MITU, COL
414	SUE	STURGEON BAY, WI
415	SLS	SALINAS, EC
430	VA	VARADERO, CUBA
512	HMV	LEXINGTON, OK

More New Radios Sold by Grove!

New Bearcat Receives Motorola And GE-Ericsson Trunking!

This new Uniden BC245XLT handheld stuns the scanner market with dual trunking capabilities! Scans conventional and either trunking mode simultaneously! Covers 29-54, 108-174, 406-512, and 806-956 MHz (less cellular) with 300 memory channels in 12 banks. Nine-pin cable connector allows downloading of computer databases. Factory preprogramming permits instant serve search for active police, fire/emergency, air, marine, and weather channels.

This feature-filled scanner includes all the normal functions found in competitive scanners as well, including channel lockout, search, selectable delay, data skip, and Turbo Scan. Rechargeable battery and AC adaptor included at no extra charge.

**Availability pending
FCC approval**

**Call for price
and availability**



Identical in appearance to BC235XLT, shown above

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Surfing the Web on a Mobile Phone

The World Wide Web is coming to a cellular telephone near you. The explosive growth of the Internet and the rapidly increasing number of wireless subscribers is pushing us into the "Fifth Wave" of computing, where mobility will no longer be a limiting factor in accessing networked information.

At present there are more than 70 million subscribers to wireless service in the United States and nearly 300 million world-wide. Predictions suggest that number will double in just two years. As the wireless subscriber base expands and matures, service providers are rolling out new features and services to attract and retain customers.

The next round of product announcements are revolving around the concept of a "Web Phone." No longer limited to simple voice calls, these mobile phones will have the ability to deliver information from the Internet using a "microbrowser."

Surfing the web on a mobile phone will be significantly different than doing so from the office or at home. Relatively slow data rates and small screen size will limit web access to retrieving bits and pieces of information and performing simple transactions. Don't plan on downloading sound files or viewing film clips, but reading news headlines, weather and traffic reports, checking sports scores, stock quotes, airline schedules and bank accounts will all be possible.

It is estimated that more than 10 percent of all phones sold next year will contain a microbrowser, and will outnumber sales of portable computers. These new phones, combined with mobile computing capability, will be marketed as "wireless information devices" or "internet appliances."

■ Wireless Application Protocol

There are currently a variety of technologies for mobile phones, including Code Division Multiple Access (CDMA), Global System for Mobiles (GSM), and IS-136. Each of these tech-

nologies has their own set of rules about how information should be communicated between the phone and the ground network. This variety makes it difficult for content developers to create products that will operate correctly on different networks.

To address this problem, in 1997 equipment manufacturers Ericsson, Motorola, and Nokia, and software developer Unwired Planet established the Wireless Application Protocol (WAP) forum to define a set of standards for mobile Internet access regardless of the underlying wireless technology.

Mobile phones that are "WAP-enabled" have embedded software to access Internet content. This software runs on top of Internet Protocol (IP) and makes connecting to existing web applications much easier. Since these applications reside on servers, not the handset, so changes and updates can be performed without requiring the user to purchase a new phone.

So far more than 40 network operators and handset manufacturers have licensed Unwired Planet's software, and in all about 100 wireless companies have joined the WAP Forum. Cable News Network is the first commercial service built on WAP, sending breaking news reports to customers through GSM networks.

■ Smart Phones

Recent product announcements from Nokia and Ericsson provide two examples of these "smart phones" that use WAP.



The Nokia 7110 contains a microbrowser, allowing the user to enter keywords into Yahoo, Inc.'s search engine. Web sites of interest can be saved and viewed, in a limited way, on the 96 by 65 pixel display. Some sites may send information directly to the phone, while others will provide menus and selections for the user to scroll through.

The Nokia 7110 is also able to send and receive faxes and electronic mail over the air at 14.4 kbps using existing GSM network services. Infrared and RS-232 connectors allow the phone to share data with laptop computers and other external devices.

Availability is listed as early summer 1999; however, it won't work in the United States. The 7110 is a dual band GSM phone, capable of operating at 900 MHz and 1800 MHz frequencies. No word yet on when a 1900 MHz model might be available for use on United States frequencies.

The Ericsson R380 is a fully-functional GSM phone with a built-in personal digital assistant (PDA). Electronic mail, a WAP browser, calendar, and an alarm clock are all accessible through a touchscreen hidden underneath the fold-out keypad. It even has a speaker phone.

The R380 uses the popular EPOC operating system, designed by Symbian especially for a mobile computing environment. Symbian shipped more than half a million copies of EPOC last year, and is touting itself as the standard operating system for mobile devices.

The R380 is scheduled to be available early 2000, but like the Nokia unit it will be a dual-band phone. U.S. users will have to wait for a 1900 MHz model to come out.

If you're not stuck on GSM, Qualcomm has announced their pdQ phone, which is a CDMA phone combined with a 3Com PalmPilot. The device, which looks like a



thick, rounded PalmPilot with an antenna and fold-out keypad, runs almost all of the hundreds of existing PalmPilot software programs. It can transfer data up to 14.4 kbps and has a 160 by 240 pixel display. With more than 1.6 million PalmPilots sold in 1998, the computing portion of this phone should be familiar and immediately useful. The pdQ phone is "coming soon," sometime in the first half of 1999, so by the time you read this it should be available for somewhere around \$700.

■ General Packet Radio Service (GPRS)

GSM has more than 135 million users and continues to grow around the world. China, the third largest wireless market, has 26 million GSM subscribers, and may have as many as 40 million by 2005. The United States currently has just over 3 million GSM subscribers.

First generation GSM data connections are limited to a maximum of 9.6 kbps. U.S. GSM carrier Omnipoint recently introduced 14.4 kbps service in Syracuse, New York, but had to upgrade both the network and the subscriber phones to support the higher speed. Other carriers may follow Omnipoint's lead if they feel there's money to be made supporting data services.

The next step forward for GSM operators is the General Packet Radio Service (GPRS), which promises data rates up to 115 kbps and easy connectivity to the Internet. Laptops or handheld computers can use existing TCP/IP protocol stacks to connect with GPRS-capable cellphones and modems. Phones with WAP-enabled microbrowsers and dedicated GPRS-capable equipment, such as mobile credit card readers, will use GPRS as a transport mechanism to reach the Internet.

Manufacturers developing GPRS equipment include Alcatel, Ericsson, Lucent, Motorola, Nokia, and Nortel. Testing will get underway this year, with commercial rollouts in Europe expected next year.

■ Bluetooth

One very practical problem with the proliferation of mobile devices is the inevitable rat's nest of interconnecting cables. Even infrared ports need line-of-sight and a fair amount of user intervention to get things working.

Last year Intel, IBM, Toshiba, Ericsson, and Nokia formed the Bluetooth Special Interest Group (SIG) to develop a specification for wireless communication between mobile computing devices. Although it bears an unusual name (Bluetooth was a 10th Century Danish Viking king who unified Denmark),



Bluetooth™

the idea behind Bluetooth is that every device will contain a small, low-power radio module to identify itself and exchange data with nearby units. With this capability users can create a "personal area network" by wirelessly connecting mobile phones, desktop PCs, hand-held computers, printers, headsets, and other peripherals. A single Bluetooth port could replace multiple I/O ports and eliminate the need for cables and connectors.

To limit interference with established services and avoid regulatory issues, the Bluetooth SIG selected the unlicensed 2.4 GHz Industrial, Scientific, and Medical (ISM) frequency band. Bluetooth units will frequency hop in one MHz steps between 2.402 GHz and 2.480 GHz, at rates up to 1600 hops per second. Units will transmit at power levels of about one milliwatt with an estimated range of about 30 feet, although 100 milliwatt amplifiers are a possibility.

Depending on configuration and operating environment, units will be able to communicate with each other at up to 721 kbps. Bluetooth also supports three 64 kbps voice channels using Continuous Variable Slope Delta modulation (CVSD) voice coding.

With one unit acting as a master and controlling traffic, up to eight Bluetooth units can gang together to create a "piconet." As many as 10 piconets can operate in a room without interfering with each other.

Security and authentication are mentioned in the Bluetooth specification, but appear fairly weak. The selected encryption algorithm is not mentioned, and the key sizes will be 64 bits or less. Expect an interesting market in "Bluetooth sniffers" that eavesdrop on piconets, and perhaps rogue Bluetooth units that hijack other people's equipment.

Bluetooth radio modules are expected to start out at around \$20 and drop to about \$5 as volume production reaches significant levels.

More than 500 companies have joined the Bluetooth SIG, including Compaq, Sony, Sprint PCS, and Hewlett-Packard. Interestingly, BMW of North America and Saab Automobile AB are also members. Chip-manufacturer Intel plans to incorporate this technology into Pentium and StrongARM processors.

■ Ricochet

Metricom's Ricochet service (*PCS Front Line*, August 1997) is upgrading their network to provide 128 kbps access to the Internet. Besides improved modems, Ricochet's pole-top radios will use the 2.4 GHz ISM band to connect subscribers to Wireless Access Points. First generation pole-top radios used a 162 channel frequency-hopping plan in the 902 MHz to 928 MHz band.

Ricochet currently has networks operating in Seattle, San Francisco, Washington, D.C., and more than 100 schools and universities. Metricom serves about 27,000 customers, charging \$30 per month for unlimited Internet access.

That's all for this month. As always, more information is available on my website at <http://www.decode.com>, and I welcome electronic mail at dan@decode.com. Until next time, happy monitoring.

Note to U.S. consumers only: It is unlawful to import, manufacture, or market cellular-capable or cellular-restorable scanners into the U.S.

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Modifying the Sony WaveHawk

Sony's ICF-SC1PC WaveHawk computer-controlled scanner sat me up straight for the brief period that it recently resided on my bench. (See Bob Parnass' review of the SC1PC and its non-computerized twin, the SC1 in *MT* Aug-98). This month I'll share with you what I found deep in the innards of these two exciting scanners. They're electronically identical except for the computer interface in the SC1PC.

■ Baseband Audio Mod

Today's rave is decoding digital radio signals. For that, you need a PC, software, and a tap into the scanner's NFM (narrowband FM) baseband audio. (Speaker and headphone signals are filtered and not good for signals any faster than about 2400-bits per second, bps.) The NFM discriminator in the Sony WaveHawk is IC-401. The baseband

audio output is at Pin 9.

Unfortunately, it's not all that easy to get to IC-401, located on the inner side of the intermediate frequency (IF) board. I didn't have an opportunity to remove it. But relax... fortunately, you don't have to see or touch IC-401. A baseband audio point is easily found on the accessible side of the IF board. Just remove the rear case — two screws by the belt clip frame and two more inside the battery compartment. Squeeze the sides of the rear case to release the catch-claws that hold it to the front case.

The visible side of the IF Board is pictured in Figure 1. Two points for the baseband audio are located at either end of a trace that runs top to bottom in the left center area of the board. Note my dark circle between L409 and RV401.

Inside that circle is a feed-through solder spot that goes to IC-401, Pin 9 on the other side of the board. Solder the (+) leg of a 10- μ F tantalum capacitor (RS #272-1436) to this point. Solder a wire to the (-) leg of the capacitor and route it to a jack of your choice mounted somewhere on the case. You'll need a wire from a ground trace on the board to a ground pin on the jack. If space is at a premium, use the pinline socket/jack method from my Jul-98 *MT* column.

■ Data Decoding

Build the Data Decoder Interface from my Feb-99 or Jul-98 columns, except use a 1-k Ω resistor for R2. (See below).

Modifying the Data Decoder Interface: There is an issue with the baseband audio level in the WaveHawk. At first, I wasn't able to decode trunk system control data using my tested and reliable Data Decoder Interface. Tuned to a strong data signal, I put a voltmeter on the baseband audio output jack and found the signal to be

0.150 volts ac, far weaker than most scanners. But nothing was wrong with the WaveHawk, so I had to modify my Data Decoder Interface.

Again, see *MT* Jul-98 or Feb-99. R2 is specified to be 3.3-k Ω . This is an optimized value for most scanners, but not the Sony WaveHawk, for which R2 must be changed to 1-k Ω .

This change to the Data Decoder Interface may be necessary for any scanner where the baseband audio output is less than 0.350V ac. A 2.2-k Ω resistor should suffice for signals between .25V-.35V, and 1-k Ω for signals less than 0.25V.

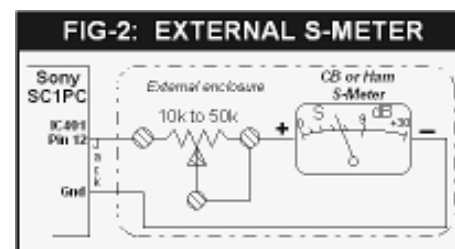
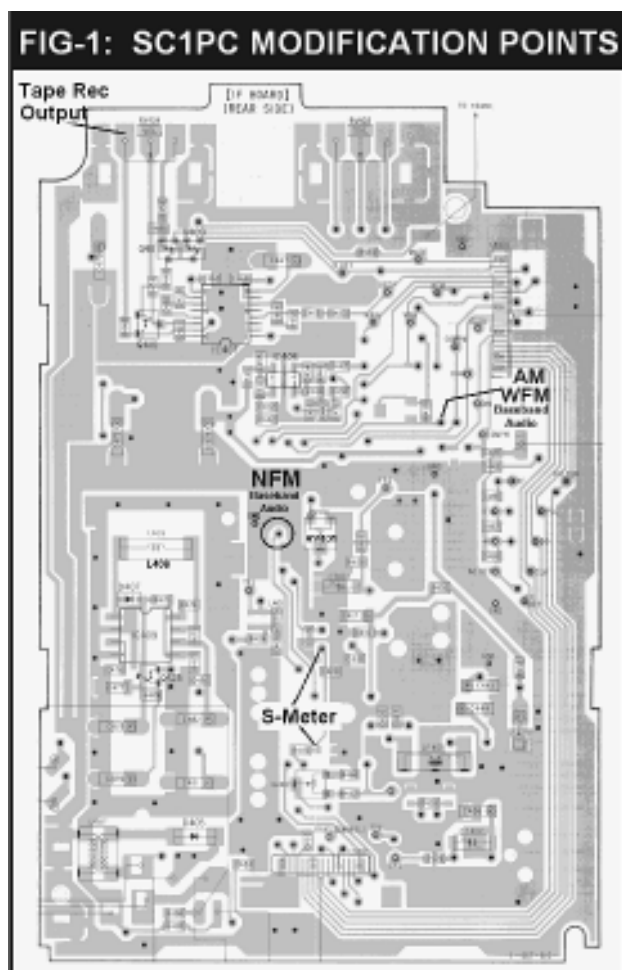
■ An S-meter Mod

The pick-off point for a ready-made signal for metering is at pin 12 of IC-401. Again, it's difficult to get to IC-401, but see Figure 1 for two easier access points on the visible side of the IF Board.

You have a choice of S-metering points, one at the indicated upper feed-thru solder point, and the other where the trace drops down to meet R-415. I don't remember which is best, so you decide. A wire connected to either of these points, along with a ground wire should be routed out to a jack of your choice.

The S-Meter must be external (lack of space inside the scanner). You can use an analog meter salvaged from a junked CB or ham radio, or you could build an LED meter from my *Scanner Modification Handbook Vol-2* (available from Commtronics). An analog meter is probably best for the SC1 and SC1PC. Figure 2 shows the external necessities.

You'll need a calibration trimmer pot, roughly 10k Ω ; maybe up to 50k Ω . Tune the scanner to a frequency on which you have a nearby walkie-talkie or other transmitter keyed up. Adjust the trim pot for exactly full-



scale deflection of the meter. All other signals will then read less, relative to strength. You'll wonder how you ever did without it!

■ AM and WFM Baseband Taps

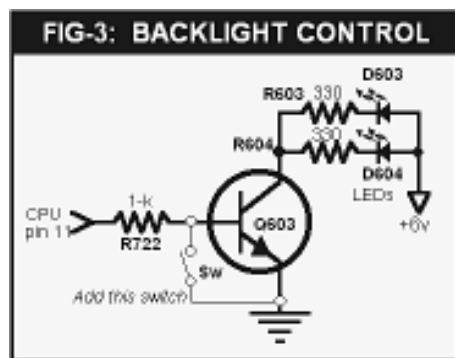
If you're into decoding ACARS (Aircraft Communication and Reporting System) or SCS (Subsidiary Carrier Service) signals, then you'll need to know about the circuit of IC-402 that processes AM and WFM signals. The baseband audio of both AM and wideband FM signals appears on Pin 21 of IC-402. The AM and WFM baseband audio point is also (fortunately) available on the visible side of the IF Board. See Figure 1 for the precise point.

■ Tape Recording

There is no reason why you can't make tape recordings direct from the WFM/AM and NFM baseband audio taps. These are unfiltered points, though, and might make unsavory recordings. You can always tap the "high" lug of the volume control for a Tape Rec output as shown in Figure 1. Solder the (+) leg of a 10- μ F electrolytic capacitor to this point and feed the (-) leg of the capacitor out to your Tape Rec jack. A ground wire is also needed.

■ Backlight Mod

The Sony WaveHawk back-light circuit is shown in Figure 3. Provided you can dig your way down to the Logic/CPU (central processing unit) board, add the SPST (single pole single throw) switch as shown for an external back-light control.



■ Tuning Meter Possibility

Unused Pin 16 of IC-402 is shown in the service manual as "Meter." Only C-440 connects to pin 16. Now if you were to add a wire to Pin 16 and run it through a series resistor to a meter, you might have a Center Tuning Meter!

I don't know what value of resistor to use, but it's easily determined with a setup similar

to the S-Meter drawing in Figure 2. Tune the scanner to a known accurate WFM signal, then adjust a trimmer pot for a center reading.

The problem here is that there is no easy access to IC-402, Pin 16. You'll have to figure out how to remove the IF Board so you can get to the inner side where IC-402 is located.

■ Extended Memory Possibility

The Sony WaveHawk uses an EEPROM (electrically erasable programmable read-only memory) chip (IC-605) as shown in Figure 4. One would think the programmable memory could be doubled (or more) using techniques published for the PRO-43 in the *World Scanner Report* (also from Commtronics). With computer control and fairly instant auto-programming of the 300-channels, maybe extended memory isn't all that hot of an idea. You decide.....

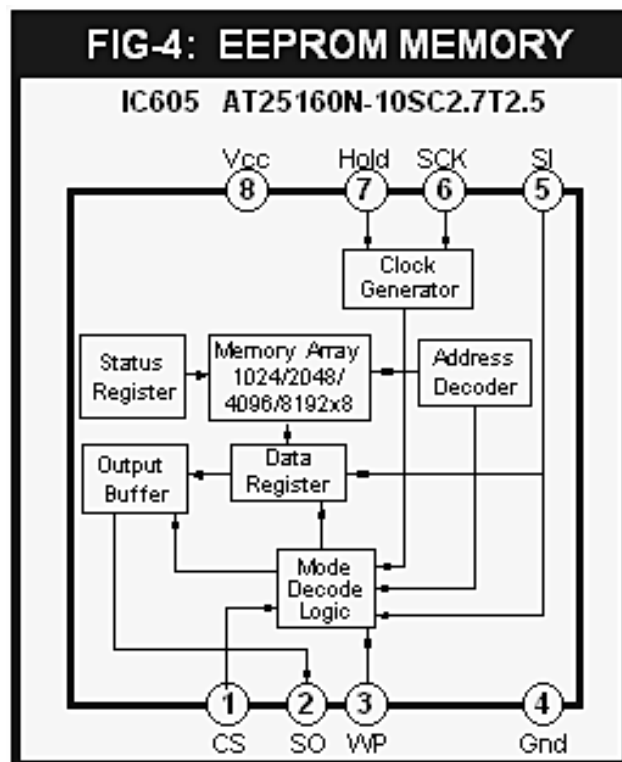
■ Other Possibilities

Mysterious "CPU Test": Pin 13 of the CPU is labeled "Test" in the service manual, but it's soldered directly to ground. This eliminates any normal keyboard or instrument test procedures. But one wonders what would happen if pin 13 were removed from ground (low) and raised "high" to +4V. The service manual says this pin is an input and that the "test mode is High." So elevate pin 13 from ground and solder a 10-k Ω resistor from it to ground. Solder a wire from +4V (high) to pin 13 and see what happens.

Cellular Mod? Probably impossible. The six keyboard matrix rows connect to the CPU at pins 93-98. Pin 99 is system ground, and Pin 100 is an NFM input. Pins 91-92 are open and have no connection or labeled function.

The five keyboard matrix columns connect to the CPU at pins 3-7. Pins 1-2 and 8/up are allocated, except pins 17 and 63 are open like pins 91-92. Pin 17 is labeled "DUB," whatever that means, but nothing is connected to it. Pins 63, 91, and 92 aren't labeled.

Logically speaking, any cellular liberation port should be between pins 91-100 and/or pins 1-8, but little or nothing is possible there.



I doubt that cellular is possible in the SC1 and SC1PC, though a comparison of non-USA models might be enlightening. Try researching a non-USA service manual. If a different CPU is used in foreign versions of the WaveHawk, then full USA coverage is out because the differences will be in the CPU firmware (code) ... and scanner firmware can't be accessed or altered.

■ Wrapup

Service manuals and information on Sony products are available from: Sony Electronics, Inc., One Sony Drive, Park Ridge, NJ 07656, (201) 930-6884 Web: <http://www.sony.com/radioscanner>, E-mail: custserv@mail.sel.sony.com, Feedback: <http://www.sel.sony.com/SEL/feedback.html>, Dealer Locations: (800) 222-7669 (also see: <http://www.grove-ent.com>)

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Repeaters and their Antennas

Repeaters are an important factor in today's radio communications. Basically, a repeater is a device which receives a signal and then retransmits that signal. Although we are usually unaware of it, much of what we receive on our scanners and other radio receivers has passed through one or more repeaters. Police departments, fire departments, metropolitan utility departments, the forest service, and many other services find the use of repeaters a considerable benefit to effective communications.

Ordinarily the main advantage which a repeater gives to our radio communications is antenna location or siting. A repeater usually has its antenna (or antennas, as the case may be), mounted high on a hill, mountain, or even a tall building in a metropolitan area (fig. 1). This gives the repeater antenna a tremendously improved line-of-sight propagation path as compared to that of the rubber duck antenna on the handheld transceiver utilized by a patrolman on the city street or a ham radio operator in a shopping mall.

The increase in communications coverage due to this one fact alone is a very significant

factor in the support of successful communications for the average repeater installation. Indeed, for repeaters using the same input (receiving) frequency, repeater antennas are sometimes too successful at covering a wide range of territory: it is sometimes possible to take a handheld transceiver located at a spot between two such repeaters and have your signal repeated by both repeaters each time you transmit! And even more extensive coverage is available via the "footprint" of satellite repeater antennas.

In most installations repeaters also offer the advantage of increased transmitter power. The patrolman on the beat or the ham on the street generally have only the very low power of a handheld transceiver. This signal is increased many, many times when a repeater receives, amplifies, and then retransmits that signal.

All things considered, repeaters are a very important part of the technology supporting today's radio communications. There are some interesting aspects of the way antennas are utilized for repeater work, so let's take a look at some of that now.

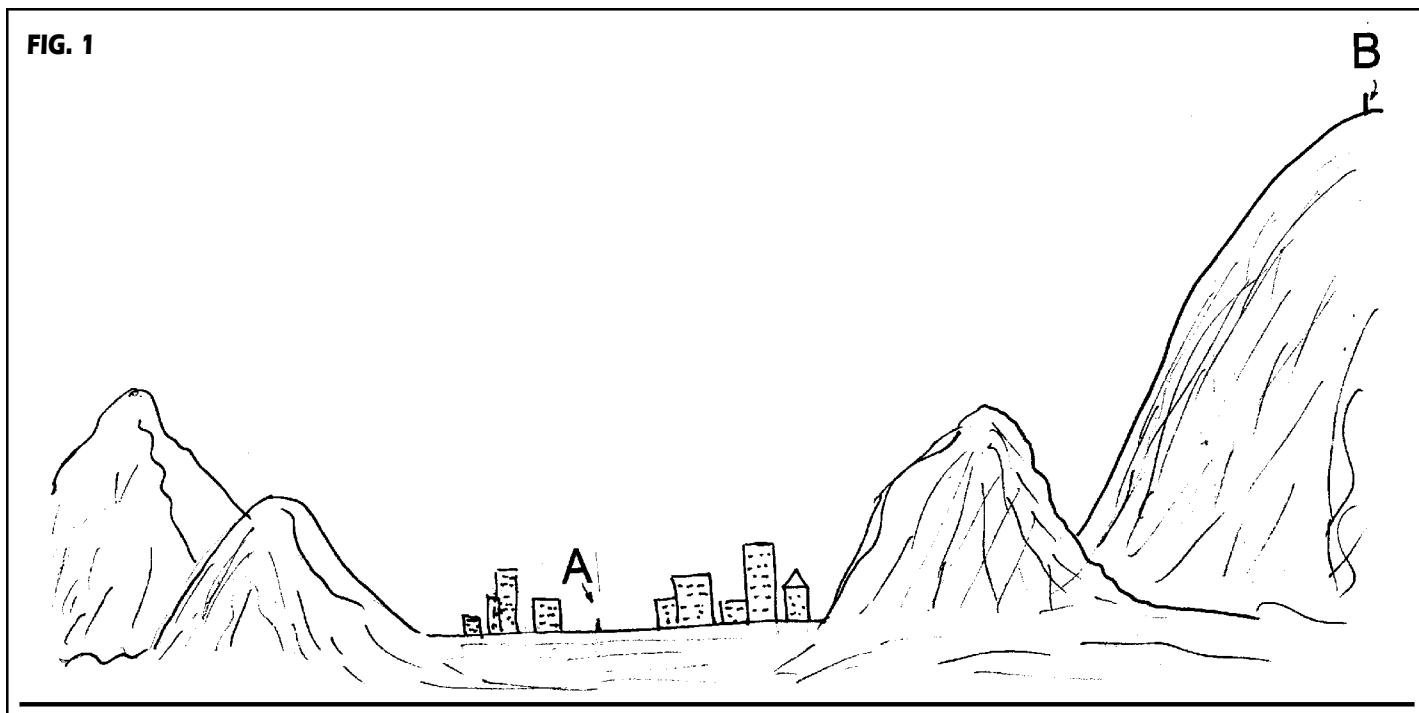
■ Repeater Antennas

As mentioned earlier, repeaters receive a signal, process that signal (this primarily means increasing its power), and retransmit the signal. An antenna is needed for receiving the incoming signal, and an antenna is also needed for retransmitting the processed signal. The installation may use the same antenna for both transmitting and receiving, or separate receiving and retransmitting antennas can be used.

The patterning of the desired coverage for the repeater may dictate the choice of an omnidirectional antenna or of a directional antenna. In any case, when the repeater receives a signal it must retransmit that processed signal in such a way that it is not received at its *own* receiver along with the desired incoming signal.

If the repeater were to retransmit the received signal on the frequency on which it was received, then the retransmit antenna and the receive antenna would have to be very effectively separated from each other. Vertical separation is often more effective in re-

FIG. 1



Communication paths from the rubber-duck antenna on the HT located at A are very limited by buildings and terrain, but the paths possible for that same signal repeated from the antenna at B allow much greater coverage.

ducing undesired antenna interaction than is horizontal distance. Often one antenna is mounted some distance above the other on the same mast.

In any case, if there is too much signal from the retransmitted signal reaching the receiver, then the retransmitted signal would be detected and reprocessed. It would then be retransmitted again. This process would disable the system and the repeater would be useless.

One approach to solving the problem just outlined above is to separate the retransmit frequency from the receive frequency. If the two frequencies are far enough apart that the tuned circuits of the receiver reject a sufficient amount of the retransmitted signal, then the retransmitted signal is too weakly received to cause a problem. Some repeaters are designed receive on one band and retransmit on another (crossband) — a practice which maximizes the receive and retransmit frequency separation.

Using separate receiving and retransmitting antennas can also help, but, if the antennas are too close together, there can be sufficient energy received from the retransmit antenna to cause receiver desensitization or repeater disabling.

With the simultaneous reception and retransmission of a repeater, the selectivity of the circuits at the receiver input and at the transmitter output are very important. This is especially true when using only one antenna for both reception and retransmission. With both the received and retransmitted signals circulating on the same antenna it is very important that no spurious signals (signals other than the exact frequencies that are supposed to be retransmitted) be fed to the antenna for retransmission, and that no spurious signals (signals other than those desired to be received) be fed from the antenna system to the receiver input. This calls for some very selective circuits.

■ Cavity Resonators:

Did you ever blow across the top of a soft-drink bottle, and make it produce a tone? The empty body of the bottle was a cavity resonator, and the energy to make the air in it oscillate and resonate came from the moving air which you blew across the bottle's mouth. No matter how you varied your blowing across the bottle's mouth the frequency (pitch) of the tone it produced was about the same. The frequency of the sound was determined largely by the dimensions of the bottle's interior.

Cavity resonators are useful in electronics, too. They are found in such things as magnetron tubes and the selective circuits (duplexers) for the receive input, and in the

retransmit output of many repeaters. Just as the air in the soft drink bottle was energized by moving air in the bottle, electrical energy can be caused to resonate in cavity resonators when moving electrical energy is introduced into their cavity. The frequency of the energy oscillating in the electrical cavity is determined largely by the dimensions of the cavity. If the quality factor (Q) of the cavity is high, then the cavity can be very selective — much more selective than ordinary capacitor-inductor tuned circuits.

Cavity resonators are so selective that, when part of a duplexer, they can be used to keep spurious signals out of a repeater's receiver input when its retransmitted output signal utilizes the same antenna! This is true even when the input and output frequencies of the repeater are relatively close together.

With other types of filtering, and even with two-antenna operation with whatever frequency separation, it may still be necessary to do a good bit of trial and error placement of antennas to achieve the separation of input and output necessary for good operation.

See the Coast Guard Auxiliary on page 20 of the April issue for an example of these repeater principles.

★ RADIO RIDDLES ★

■ Last Month:

I asked: "Could RDF (radio direction finding) be used to track thunder storms?"

The answer is "yes," by RDFing the so-called static, or *sferics*, produced by the storm as I discussed in this column last December. The RDF antenna would be used in the same way as described in last month's discussion. The approximate position of the storm would be at the intersection of the bearing lines (indicated directions plotted on a map) obtained from the RDF antenna. The bearings should be taken from a few widely separated locations.

Always remember that an outside antenna should never be used when weather that may produce lightning is in your immediate vicinity.

■ This Month:

Is it possible to make a repeater using no electron tubes, solid-state devices, or other active devices?

You'll find an answer for this month's riddle, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, 73

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TrunkTrac, the first, and one of the most sophisticated trunk tracking technologies available, is now even better. New pricing and additional features make TrunkTrac your best choice if you're serious about tracking Motorola Type I, II, III, and Hybrid systems. TrunkTrac now supports the BC895XLT, PCR1000, R7000, R7100, R8500, R9000, and the RS Pro 20xx series with an OS456/535 board installed.

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Adventure Radio Society

Last month I mentioned the "Flight of the Bumblebees" event sponsored by the Adventure Radio Society (ARS). This month I would like to spend a little time talking about the ARS itself.

The Society was first formed in May of 1996 and boasts over 500 members today. The goal of the ARS is to encourage hams to operate in an ecologically sensible manner! Members are urged to travel to various sites during ARS activities by foot, bicycle, boat or by any other human powered means of travel — no engines! The group is a QRP (low power operation) organization and members limit transmitter power to five watts or less.

Each month ARS has an activity called a Spartan Sprint. These activities take place on the first Monday of every month and last two hours. While many members will conduct mini-expeditions to some place of natural beauty, most will operate from their home. Transmitter power of five watts or less is mandatory.

You can obtain information on the Sprints and complete info about the Society through the *ARS Sojourner* newsletter, via the QRP-L internet group or by direct e-mail (if you are an ARS member). The newsletter contains lots of good info on QRP, and camping/hiking with ham radio.

For more info on the Society and info on how to join; contact Richard Fisher, KI6SN either at 1940 Wetherly St. Riverside, CA 92056 or via e-mail to ki6sn@yahoo.com. If you would like to see the group's newsletter on the internet the address is <http://www.natworld.com/ars>. There is no cost to join the Society.



■ 1999 Light House Day Special Event

Last August I joined in this special event quite by accident and had a ball. While I only worked a dozen light houses, it was exciting looking for them. Most of the QSL cards were photos of the light house or light ship



Ecological operation is a natural interest for Lorraine Aubert, AC6XK, who is a ranger in the Mt. San Jacinto State Park Wilderness

and really neat to see.

This year the activity will take place August 21/22. To date 41 countries are reported to be participating from some fairly rare locations. More info is available from K2JXW (e-mail k2jxw@amsat.org or GM4SUC (e-mail gm4suc@compuserve.com).

■ Others

And of course June is ARRL VHF contest time (second weekend) and Field day on the last weekend of June.

A favorite event of mine that is also taking place in June this year is the Rochester Hamfest on June 4, 5, and 6. This hamfest is one of the better ones in the Northeast, and hope a lot of you will join me in attending.

■ Hamcalc Version 38

Several years ago, I reviewed VE3ERP's Hamcalc computer disk. I recently received the latest version of George's diskette and am very pleased with it! Hamcalc contains programs on almost every phase of the radio hobby, with more than 200 programs there are just too many to comment on; however, I have never found a problem with any pro-

gram and use Hamcalc very frequently. Every active ham or SWL should have a copy of this disk (3-1/2 in. only).

You can obtain complete info on Hamcalc 38 from George Murphy VE3ERP, 77 McKenzie St. Orillia, ON L3V 6A6, Canada, or e-mail to ve3erp@encode.com.

Hamcalc must have GWBASIC.EXE on your C drive in order to operate. Price is only \$5.00 to cover cost and shipping (and well worth the price).

■ ARRL Members ONLY (and Ike's Soap Box)

If you are on the internet and an ARRL member, I urge you to visit their web site at <http://www.arrl.org>. All of the latest news regarding ham radio is at this site and hundred of related links are listed.

I did find one disturbing bit of commentary at this site recently in regard to retaining our bands. It seems the leadership feels we should all be using the latest and greatest techniques in our operating. In fact, the way I read things, the ARRL thinks we should not be using old time modes such as SSB, FM or CW (seems to ruin our image). The League insists on calling ham radio a service and downplaying the hobby aspect.

While it is nice to experiment with new modes, not everyone has the means or desire to be Mr. Radio. It must be recognized by the ARRL, the FCC and all interested parties that ham radio is a "hobby"; and through this hobby people of all ages are introduced to higher forms of technology. It is this interest that spawns our new technicians and engineers, and drives the uninformed to become informed and perhaps the Edisons of tomorrow. Not everyone has an IQ of 160+, but a lot of folks with average intelligence can be influenced by this hobby and some of them will make outstanding contributions to our technology pool. This is the real ham radio service!

The No Code license was introduced to bring more people into ham radio, as is the restructuring of our bands. The League must relax a little and not worry about hams providing public service, inventing new technology and presenting a cool image to the world. Ham Radio is a hobby, and it is a service!

Cobra's Formidable Line of MicroTalk™ FRS Radios

The first FRS radio I ever saw — more than two years ago — was from Cobra Electronics. It was slim and looked a bit like a cell phone. Operation was cell-phone-like as well: you held the speaker to your ear and spoke into a microphone at the opposite end of the case. While not everyone liked the design (traditional radio types found it confusing), that first exposure to FRS convinced me that Family Radio Service is a *Cool Thing*.

Now Cobra is capturing a significant share of the FRS market with a new line of completely redesigned “MicroTalk” FRS transceivers. There are three different units. All offer 1/2-watt transmit power (the legal limit); all have “call” buttons, a talk confirmation tone (Roger Beep) and all operate on four AAA batteries. All have flip-down antennas, battery-saver circuits, low battery indicators, removable belt-clips and the ability to take advantage of an impressive line of Cobra accessories.

In addition, all have a volume/on-off knob on top of the radio, a button for defeating the auto-squelch, drop-in charger contact points, and an accessory socket. And they each measure just 4 inches by 2.5 inches by 1 inch with the antenna flipped down.

The Cobra MicroTalk 1 is the simplest of the line. It offers just two channels (labeled A and B, but really FRS channel 8 and channel 12) and a manual switch for selecting between them. Operating this radio requires only turning it on, choosing a channel, adjusting the volume, and pushing the button to talk. My wife summed up the advantages of this radio succinctly: “Simple is good.” It’s also very affordable — just \$74.95 for one radio or \$129.95 suggested retail price (SRP) when sold in a two-pack.

The MicroTalk 2, at an SRP of \$119.95 each, delivers a lot more features: a full 14 FRS channels, a locking key, a back-lit liquid crystal display, CTCSS (continuous tone coded squelch system) tones for blocking reception of unwanted transmissions, and even voice scrambling capabilities.

Programming the MicroTalk2 is pretty straightforward: press the FUNC key until the function you want (CTCSS tones, voice scrambling, etc.) blinks; then use the UP/DOWN keys to set to set the tone you want or turn voice scrambling on or off. Once you get the



MicroTalk 1, 2, and 3 perform well and are complemented by a wealth of accessories.

set-up you want programmed, just press the ENTER key to store it.

There is a peculiarity, however: on the MicroTalk2 (and the MicroTalk3), you can program a CTCSS tone for one channel but not for another, and you can program different tones for different channels. But if you turn on voice scrambling, it applies to all channels across the board.

The MicroTalk3, at an SRP of \$149.95 has all the features of the MicroTalk2, plus a VibrAlert™ Silent Vibrating Alert feature, the ability to scan for CTCSS tones (this is handy if you are trying to talk to someone but they can't hear you because they have CTCSS tones activated), 10 memory locations, and water resistant construction. That's the good news.

The even better news is that all three of these radios — MicroTalk 1, 2, and 3 — perform exceptionally well, delivering crisp, clean audio on transmit and receive. The range is what you would expect from top-of-the-line FRS units and is competitive with other market leaders. In fact, the MicroTalk1, the least expensive unit, outperformed its bigger brothers by a few yards during the range tests. I suspect the differences were due to unit-to-unit variations, but even so, it's nice to know that the lower-priced unit isn't the “ugly stepsister.”

Finally, Cobra has made a ton of accessories available for these radios: speaker-microphones, a belt holster, and rechargeable nickel metal hydride battery packs. Two of the accessories deserve special mention. The drop-in charger for MicroTalk radios (SRP \$29.95) has a neat feature: in addition to a slot for the radio, there is also a slot for another NiMH battery pack. That means you can charge up two batteries (one in the radio, the other outside of it) and have two fresh batteries to bring with you.

The second cool accessory is a headset voice-operated (VOX) microphone (SRP \$49.95). There is one earphone, a springy hoop to hold it to your head and a microphone on a boom. A single AAA battery goes in a small control box where there is a switch for choosing between VOX and push-to-talk operation. It works extremely well, and while I was writing this column, I made extensive use of it and a MicroTalk3 to communicate with my 5-year-old son who was playing in the yard. He was outfitted with a MicroTalk1 and the Cobra lapel speaker-mic.

The bottom line: With MicroTalk, Cobra has created an excellent series of FRS transceivers, and I can recommend them heartily. For more information, visit Cobra's website www.cobraelec.com or call 1-773-889-3087.

Interfacing with the ICOM IC-R2

It's been almost a decade since I purchased a brand new scanner radio. Don't get me wrong — I own over twenty different scanner radios and some are quite new. However, most have been purchased at radio/ham meets from people with short attention spans and/or poor financial planning. I buy them for 50 percent of their cost, and, in some cases, when they are less than a year old. I can usually wait that long to own one.

But when I saw the ICOM IC-R2 — 400 memories, 0.5 MHz to 1.5 GHz and all in a tiny package less than one-half the size of a pack of cigarettes — waiting was not an option. With my birthday nearing, I dropped hints to every family member who would listen.

■ The countdown begins

The reviews on the web (<http://www.strongsignals.net/hm/revr2.htm>) confirmed that the R2 was one of the first of a new breed of very small size, wide frequency range radios. The review pointed out factors that limit the R2's use on the shortwave bands. Since the smallest tuning step is 5 kHz and no SSB mode is provided, shortwave utility listening is out. Every fruit has its blemish. Still, the reviewers were in awe of the performance from such a small package. Bob Parnass's review of the R2 in the April 1999 issue of *MT* also gave it high marks.

With hopeful anticipation, about a week before my birthday, I began surfing the net looking for info on my hoped-for birthday present. ICOM's site <http://www.icomamerica.com> gave very complete specs and pictures of the radio. The description mentioned a serial port connection, but all the picture showed was an small earphone jack on the top of the R2. Sure enough, this jack is a mono earphone jack, but, by using a stereo jack, ICOM uses the extra contacts as the serial data connections. Very slick! I had to have one!

■ Interfacing reality to expectations

As in most computer/radio applications, a level converter interface is required to change the radio's 3 to 5 volt data output/input to computer serial (RS-232) port levels. Many semiconductor

companies make single chip integrated circuits to do this very job. Therefore building an interface should be very simple, easy and inexpensive

As B-Day approached I checked the Web for an R2 interface schematic diagram, and was not disappointed. At <http://www.dspace.dial.pipex.com/stephen.t/r2max233.html>, ready-made R2 interfaces are available. However, for those of us who would like to burn our fingers building our own, the site also provides circuit diagrams. Figure 1 shows an interface circuit using a Maxim part MAX233, which I happened to have in my parts box. With only three other components required, the interface was completed in one hour.

Just a few simple things to remember if you build your own. Pin 1 of the chip is found by viewing it from above, with its pins pointed down. There will be a round mark in the corner of one of the short ends. This is Pin 1. Alternatively, a mark will be found in the center of one of the short ends. Looking from above, Pin 1 will be to the left of the mark. The pin count continues down the long end. Then across the bottom to the other side going up. The highest number pin will be across from Pin 1.

The capacitor used is polarized. It has a minus end, which is marked on the body. This must be connected to the chip. Since the interface connections are low power, the resistors can be the smallest you can find.

Very carefully wire the circuit to the pins of the serial cable. [Important: the diagram shows

the 25-pin serial cable connection in parentheses. The other numbers are for the 9-pin connector.] Double-check all connections. Then check them again. If you feel the least bit uncomfortable about building the interface you can buy it from the website above.

Using the DIP package version of the MAX233, the interface just fits into the plastic shell of the 25 pin serial cable. It was a squeeze.

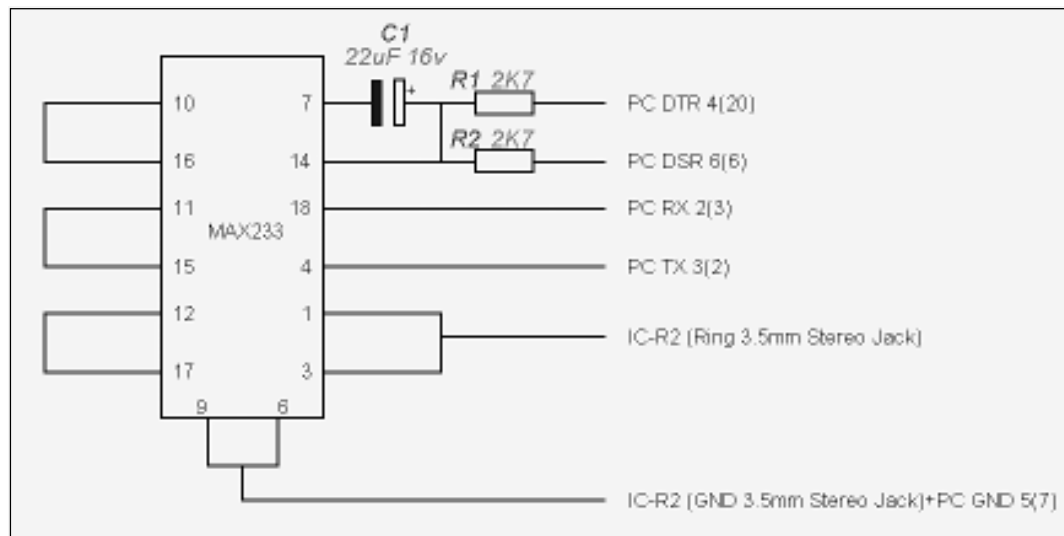
A circuit using the more common MAX232, but requiring a few more components, can also be found at this website. Also take a look at <http://www.hamradio.cz> for additional interfaces and info.

■ Soft[ware]ly making my desires known

I was sure that my hints had not gone unnoticed. So sure that I now surfed the Web looking for PC software for the soon-to-be-mine R2. I hit pay dirt with Goran Vlaski's site at <http://vlaski.virtualave.net/>. Here I downloaded a very nice program, the small (80 K zip file) IC-R2 Programming Utility 1.01. This program allows you to set all the many, many functions, features and memories of the little R2 from a PC screen. The convenience and features of a computer-controlled desktop scanner in a tiny portable, all soon to be mine — I hoped.

After unzipping the files into a new directory, the R2 utility program can be run. Figure 2 shows the one and only command screen on a Pentium 233MMX running under Windows 95, which is required.

FIGURE 1: R2 - PC Interface from <http://www.dspace.dial.pipex.com/stephen.t/r2max233.html>



Be sure to read the comprehensive ReadMe instruction file which is included. In order to use the program we must first tell it where we have connected our interface. This is performed via the Setup menu on the top command line. That's it for setup.

I suggest the first thing you do is to download all the current settings of your R2 to the program. Then you can store these original settings in a file on your PC. Clicking the Download box at the lower right duplicates all the data from your R2 and brings it to the computer screen. Save this file using Save As under the File menu at the top of the screen. Now, no matter what disaster hits, you can restore your radio to its original condition by uploading this file to the R2.

Goran's program does not work in real time. For example, when you change the frequency on the computer screen, the radio's frequency does not change. In order for any radio change to take place the *entire* memory map of functions and frequencies must be uploaded to the radio. The process just takes a few seconds and therefore could be performed after each change.

The top portion of the screen represents the information stored in the R2's 400 memory locations. Each row is a memory location. Each column is a user-settable function for that memory. For example Row 0-0 is Bank 0, Channel 0. In this R2 a frequency of 146.010 MHz is in this location, with a +600 kHz offset, listening for a 88.5 Hz tone in the FM mode and having a tuning step of 15 kHz.

If we want to enter data into a channel or modify existing data, we need only scroll down to the channel and left click on it. This channel now appears as the top editing row. In Figure 2 you can see channel 0-0 in the top editing row and also in its normal location in the database below. For example, if we want to change the mode of channel 0-0 from FM to AM, this would be done by clicking the down arrow next to FM in the first row and selecting AM. Entering a new frequency is as simple as clicking on the Freq. box and typing the new frequency.

The bottom half of the screen allows you to set all the various command functions of the R2 such as power saving, speed dial and much,

much more. Remember to save the changes to a new file and then upload them to the R2.

I'm sure that without help from a program such as this many people are overwhelmed at the complex key press sequences which are required to get to all the features of the R2. The result is that they do not utilize all the power of the radio. Or they get confused, disappointed and sell it. (Hmmm, easy R2 pickin's at the next ham meet. No, I cannot wait.)

■ "The birthday candles are lit"

Every physicist learns those words — the encoded message that told the President that Enrico Fermi's team had succeeded in creating the world's first controlled nuclear fission reaction. Now, as I watched my birthday candles burn I thought of Fermi. If there was no R2 in the packages that lay in front of me, there would surely be an *uncontrolled* nuclear reaction!

Blowing out the candles and by-passing the shirt boxes, I opened the smallest box first. Yes! I was now the owner of an R2. As my last guest was driving away I was firing up my computer and the R2.

One flip through the R2's instruction manual and I was exceedingly happy to have the computer Utility program to start me off. It was operational and fully functional in fifteen minutes. Over the next few days it would take me a few *hours* of manual reading to repeat the operation, using just the R2's buttons and no computer.

■ Was it worth it?

Others have given full reviews of the R2, so I will just give you my impressions. In side-by-side comparisons on VHF-UHF, the R2 performed as well as my large BC100XLT, which I rate quite high. But it is almost three times the size of the R2 and limited in frequency range. Score a big one for the R2. But what about shortwave?

First, without a different antenna, don't even try it on shortwave; it appears deaf. Even strong stations such as BBC are barely readable from inside my house. After days of testing and comparing, it comes down to this simple fact: if you own an R2 and you want the best all-round performance, immediately replace the ICOM antenna with a telescoping rod antenna. You'll need to buy an SMA to BNC adapter for around \$7 (if you have a problem locating them at this price email me for details). The improvement in all bands is very noticeable. *Now* we have a radio.

The addition of an SSB mode and smaller frequency steps would make the R2 perfect. Is there anyone home at ICOM marketing? I get immediate responses to my comments from radio companies in Australia and Europe. But never from ICOM America. And how about

someone making a real-time program for the R2, so it would act like a desktop scanner?

If anyone has other info on R2 software or mods, email it to me so we can share it with our readers. But, even without these, the combination of the R2, the interface and the Goran's program is hard to beat — and it's always in my laptop case when I travel. The gift that keeps on giving!

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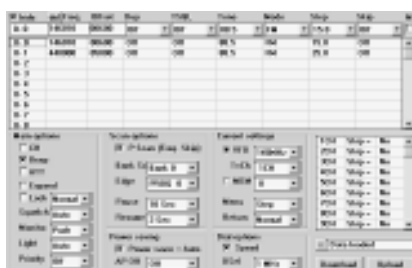
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FIGURE 2: Screen shot of Goran Vlaski's R2 Programming Utility



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column does not
wish to have his
material republished**

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Mini-Circuits ZFSC-4-1 Splitter

"How do I connect two or more scanners to the same antenna?" We addressed that question in September 1997 *MT* and tested a Stridsberg Engineering MC202 two port receiver multicoupler (splitter). Except for an 18 dB notch near 714 MHz, our passive (not amplified) MC202 exhibits fairly low loss from about 0.5 to 1200 MHz, well beyond its rated frequency limits.

Mini-Circuits is another manufacturer of splitters and filters, and their products are well known to RF engineers. We recently tested a Mini-Circuits ZFSC-4-1 four port splitter (Fig. 1) and were gratified with the construction and performance. The ZFSC-4-1 is small and ruggedly built entirely of metal. The high quality BNC connectors are silver plated.

In theory, a perfect four port passive splitter incurs at least 6 dB loss. Mini-Circuits rates the ZFSC-4-1 for 1-1000 MHz and our sample proved usable to at least 1500 MHz. Tests show our splitter has a fairly uniform 6-7 dB loss from 0.5-900 MHz (see graph).

Port-to-port isolation — i.e., the ability to prevent interaction between receivers — exceeds 25 dB below 1000 MHz (see graphs). Our testing shows the amount of isolation varies depending on whether the two ports are adjacent or located on opposite sides of the splitter's housing, but the 25 dB mini-

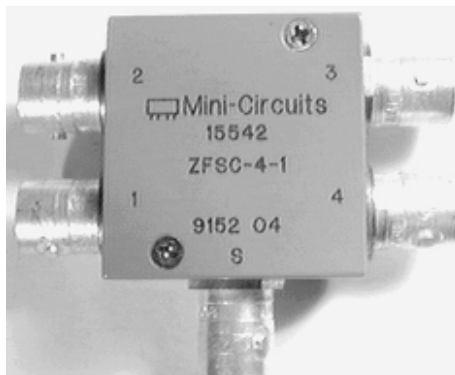


FIG 1. Mini-Circuits ZFSC-4-1 four way splitter worked well from 500 kHz-1000 MHz.

mum figure is respectable.

There's no question that the loss from a passive four-port splitter degrades reception of weak signals. You could opt for an active splitter with an amplifier built-in to compensate for the losses, but active splitters have their own drawbacks. TV and FM broadcast signals overload our VHF/UHF Stridsberg Engineering MCA204, an active four-port splitter. The overload causes spurious responses so we hear TV and FM signals in parts of the VHF-high band.

The ZFSC-4-1 list price is \$89.95. Mini-Circuits offers dozens of other configurations with different connectors. Mini-Cir-

cuits is located at 13 Neptune Avenue Brooklyn, NY 11235 U.S.A. Phone: (718) 934-4500 or (417) 335-5935 Fax: (718) 332-4661. You can visit their web page at <http://www.minicircuits.com>.

ICOM IC-R2 Portable Continued

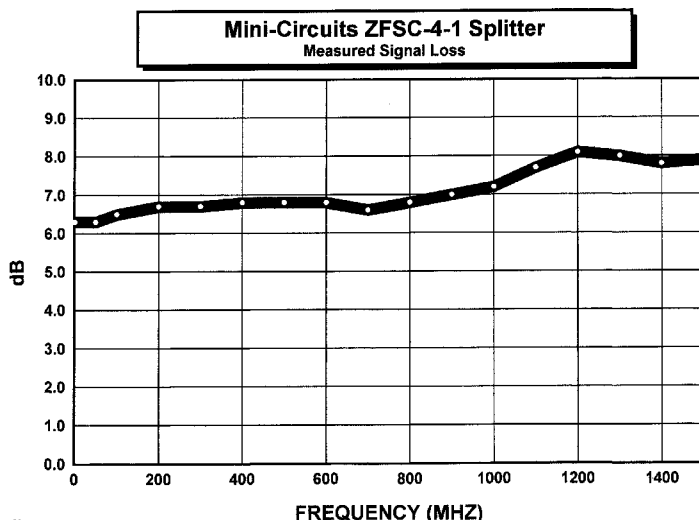
We reviewed the ICOM IC-R2 portable scanner (s/n 1385) in April 1999 *MT* and were delighted. We bought an IC-R2 (s/n 1104) after returning the loaner to ICOM. Both receivers were equally sensitive, about 0.2 μ V for 12 dB SINAD from 25 to 1000 MHz.

Both IC-R2s hear cellular phone signals at 20 kHz increments in the 490 - 508 MHz range. We used a signal generator and other test equipment to explore this further. Technically, these signals are not images and the frequency relationship is:

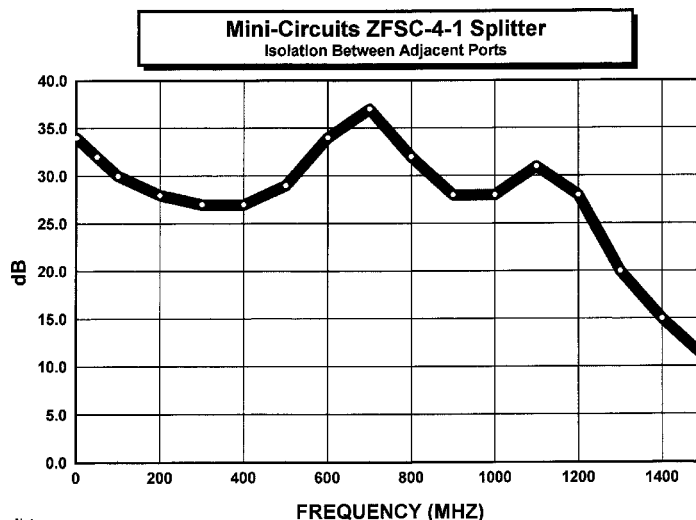
$$\text{received frequency} = (\text{display frequency} * 1.5) + 133.35$$



The number 1.5 in the previous equation means that for every 20 kHz you increase the IC-R2's display frequency, you can hear a "phantom" signal 30 kHz higher in frequency. That correlates with hearing



Notes:
Measurements made on one sample in 50 ohm system.
Unused ports terminated in 50 ohms.



Notes:
Measurements made on one sample in 50 ohm system.
Unused ports terminated in 50 ohms.

the cell signals spaced at 20 kHz when they are actually transmitting at 30 kHz intervals.

The 12 dB SINAD sensitivity to these signals varies from 2.8 μ V at 868.352 MHz (490 MHz displayed) to about 1 μ V at 895.35 MHz (508 MHz displayed).



■ New Scanner from Electra Corp.?

It has been over a decade since Uniden Corporation bought Electra Corporation's scanner line. Now there's word from Electra's president David Lovell, W9DAG, that Electra plans to introduce a new scanner product, possibly named Tiger Scan. Watch the Electra web page, <http://www.electracorp.com>, for details.

David writes "While we still have a few accessories for the venerable (pre Uniden) Bearcat Scanner line, we have decided at long last to discontinue repairs on same." Electra can still furnish crystals, AC power cords, antennas, user manuals, and a few other odds and ends, but most ICs and custom parts are gone. Electra Corporation is located at 11915 E. Washington St., Cumberland, IN 46229. Phone (317)894-3229.

Electra is referring customers who require repairs to G & G Communications, 7825 Black Street Rd., LeRoy, NY 14482. You can call G & G at (716)768-8151, view their web page at <http://www.iinc.com/ggcomm>, or send email to ggcomm@iinc.com or ggcom@aol.com.

■ Batteries Plus

The author is always looking for interesting electronics and surplus stores to visit and enjoyed shopping at the local Batteries Plus. Batteries Plus is a franchise of over 200 stores in the US which sell nothing but batteries, chargers, NiCd conditioners, and flashlights. They sell all kinds of batteries from ordinary alkaline cells to rare industrial batteries. If they don't have it in stock, they can order it.

In addition to replacement camcorder and computer batteries, the local store sells replacement walkie-talkie batteries, high capacity NiCd and NiMH AA cells and chargers. The shelves are stocked with everything from tiny hearing aid batteries to humongous truck batteries too heavy to lift.

If you need a replacement NiCd insert for a BC200XLT, Batteries Plus will construct it right inside the store. You can visit the <http://www.batteriesplus.com> web page that lists store locations by state.

■ In Closing

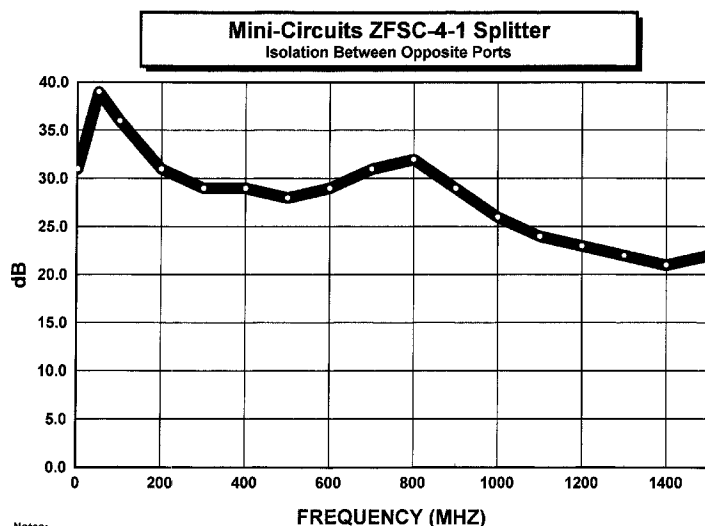
Rich Lucchesi, WA2RQY, supplied a photo of an old Skyway aircraft band converter which allows VHF reception when placed next to a broadcast receiver (Fig. 2).

Congratulations are due to reader Ron Smithberg of Joliet, Illinois, who passed his ham radio tests and is now licensed as KB9UER. Ron's 20+ years of scanning experience forms a solid foundation for his new hamming pursuits.

My web page contains a list of past Scanner Equipment columns since January 1995. See <http://www.megsinet.com/~parnass>.



FIG 2. Old Skyway converter allowed VHF air band reception when placed next to a broadcast receiver (photo by R. Lucchesi, WA2RQY)



Notes:
Measurements made on one sample in 50 ohm system.
Unused ports terminated in 50 ohms.

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Q. *I recently measured the voltage of a new alkaline cell as 4 volts, and a freshly charged NiCd at 3 volts. How can I be getting these higher voltages? (John Morris, Oak Harbor, WA)*

A. A single nickel-cadmium (NiCd) cell (A, AA, AAA, C, D, whatever), when fully charged, measures a terminal voltage of 1.25 volts, quickly dropping to about 1.2 during its use, and finally “fully discharging” at about 1 volt. A single alkaline cell, factory fresh, measures 1.5 volts, gradually dropping with discharge until it no longer operates its accessory (That could be just a fraction of a volt).

If you are measuring just one cell and you’re getting 3 to 4 volts, you’d better have your meter checked!

Q. *Does exposure to electromagnetic fields cause cancer or other health problems? (Donald Michael Choleva, Euclid, OH)*

A. There is direct evidence that strong electromagnetic fields cause cancer in laboratory animals, but only anecdotal (indirect) evidence that humans are afflicted by nearby alternating current or radio energy fields. Experiments continue to be performed, and the power and cellular industries continue to deny any link.

There is no question that strong fields induce heating of the body’s tissues, just as in a microwave oven. The long-term effects of lower level radiation have not yet been firmly established.

Q. *If aeronautical VHF/UHF comms are in AM for safety purposes (so that a MAYDAY message can be heard even if another unit is transmitting on the same channel) then why are marine VHF comms in FM? (Jim Rubin, E-mail)*

A. I suspect it came about when this service was incorporated into the post-WWII 150-

174 MHz VHF-FM high band (land mobile) service. It accommodated the two-way industry without their having to make special radios.

So far as aircraft VHF/UHF being AM because of being able to hear a “Mayday” when someone else is talking, that is a widely held myth (which I used to believe and probably propagated!).

The fact is that pre-WWII aircraft were all outfitted with AM because narrow-band FM wasn’t around yet. Following the war, commercial aircraft companies bought out the military aircraft fleet — and their radios. That’s how AM became the mode for commercial aviation.

Q. *My neighbor’s electric fence is driving my shortwave receiver crazy. What can I do? (Kenneth Clark, E-Mail)*

A. One way is to put a resistor between the “hot” lead and the fence to reduce the amount of current, while still delivering a shock to the livestock. These are available commer-

Bob’s Tip of the Month

Replaceable NiCds: Rolling your own!

How often have you watched your favorite frequency counter, scanner, cordless soldering iron or vacuum cleaner, portable phone, or other rechargeable accessory gradually lose its oomph? You know that replacing the battery pack is going to be expensive — if you can still find a pack for that model. The answer can be quite simple.

Most of these devices use conventional-sized cells: AA and C to be more specific. It’s usually a simple matter to remove the battery pack and compare its constituent cells with conventional replacements from vendors like Batteries Plus, Radio Shack,

or even your nearest hobby shop or electronics department store. Who knows, you may even find a cordless phone pack that matches yours!

First, check to see if the cell’s physical size matches those in the expired pack, then make sure they have solder tabs. Be sure there will be enough clearance in the battery compartment of the accessory to house the new battery. And be sure that you are buying NiCd cells, not another chemistry.

Before you do the soldering, it’s a good idea to “wet” the tabs with hot solder; this will make the series hookup much easier when you begin the wiring. Line the cells up

like those in the expired pack and align the tabs for easy soldering; secure them into position with a wrap or two of electrical tape.

Bend the tabs so that they meet those of the adjacent cells; quite likely, some will not be positioned exactly right, so you will have to use jumper wires to interconnect them. When you solder the positive (+) tabs, be sure to prevent the tabs, wires, or solder from touching the outer cylinder of the cell; you can use a piece of thin Teflon or other non-conductive insulation to space the lug from the cylinder to prevent short-circuiting.

cially from fence charger dealers. Those dealers (and manufacturers) are bound to have suggestions.

(1) If the charger is AC powered, you might try putting an RFI (radio frequency interference) filter such as those sold at Radio Shack right at the housing of the unit;

(2) Depending upon the size of the fence, you may also wish to walk the perimeter, clearing any brush or grass that might touch the hot wire;

(3) (Not recommended) Take a wire and short out the fence wires;

(2) Replace the charger with a more recent, better filtered unit;

(3) Buy the JPS ANC4 Noise Canceller for your receiver; it works great;

(4) Try a new hobby or move.

Good luck.

Q. *If all the hype about "co-phasing" mobile CB antennas were true, wouldn't hams be doing it? (Mike Elcsisin, Philadelphia, NY)*

A. Right on! If two CB whips are not separated by at least 8 feet, there is no perceptible gain; even then the gain is only a slightly-perceptible 3 dB. The only thing accomplished by side-by-side CB whips is increased wind resistance.

Since the phasing characteristic is a function of frequency (wavelength), the higher the frequency, the closer the antenna elements must be for the same interaction. At two meters (144 MHz), the elements would be separated by roughly 19 inches.

But remember, antenna gain always comes from a loss in some other direction, so adding directors and reflectors decreases both radiation and reception from the sides and back of the array.

Q. *What is receiver desensitization ("desense") and how do I know if my receiver has it? (W.A. Denovan, Providence Bay, Ont.)*

A. Desensitization is not a permanent affliction, it is only produced during the presence of an unusually strong signal. Conventional receivers and scanners have automatic gain control (AGC) circuits which lower the gain (amplification) of the receiving circuitry when a received signal is so strong that it is likely to produce internal interference products like intermodulation ("intermod").

There is nothing simple you can do to a receiver to improve its AGC characteristics, or its dynamic range to improve intermod. This is an issue of receiver design, and many compromises are made to assure price-competitive products for the consumer market.

If you suspect that your receiver or scanner no longer has the sensitivity it did originally, first check the antenna system, the usual culprit. This means a visual inspection of the connectors, adaptors, coaxial cable, and antenna itself. You should also make a continuity check with an ohmmeter to confirm low resistance through the line, and high resistance ("open") across the line. If you don't find a problem, try another radio on the same antenna to see if it receives noticeably better.

Reduced sensitivity in a radio is usually traced to either the antenna jack or the preamplifier transistor(s). Transistor burnout can be caused by static discharged produced by an external antenna, nearby lightning voltage induced on the external antenna, a high-powered transmitter operated nearby, or a low power transmitter accidentally

touching the receiver's antenna.

Q. *Are scanners and shortwave radios Y2K compatible? (Many inquiries)*

A. Absolutely. The entire Y2K issue has one common denominator: If it makes date computations, the software must be able to calculate beyond 1999. But even though some shortwave and scanning receivers have clocks, they don't do date calculations, so the Y2K issue is not a problem.

Questions or tips sent to "Ask Bob," c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove-ent.com. (Please include your name and address.) The current "Ask Bob" is now online at our WWW site: www.grove-ent.com

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EXP-1750 LF Transceiver Kit

By Kevin Carey

There was a time when you had to build equipment from scratch if you wanted to get on the 1750 meter (160-190 kHz) license-free "Lower" band. Usually, this meant assembling a breadboard transmitter and a separate receiving converter for use with an HF receiver. The result was often a complicated arrangement that took many hours to get working properly. Dave Curry (WD4PLI) is helping to change all that. With his EXP-1750 meter SSB/CW Transceiver kit, you can be on the air in a rather short time (transmit and receive) using a compact, single board solution.

The EXP-1750 is an advanced hobby-grade transceiver, and includes many features that are highly desirable for longwave operation. It is clear that serious thought was given to the needs of weak-signal Lower work. In addition, the rig contains some features that, while not essential, add considerable flexibility to the rig (e.g., squelch control, adjustable RF output, illuminated "S" Meter, etc.). See Table 1 for a full list.

The instruction manual for the transceiver includes a brief introduction to 1750 meters and tells what you can reasonably expect to achieve on the band. Dave is quick to tell you that the longwave band is not for the faint of heart. It can, at times, be plagued with natural and man-made interference that will test the patience of even the best operators. As such, don't expect to switch on your rig and instantly raise your buddy 45 miles away—as you might expect through a 2-meter repeater.

On the other hand, there will be times when 1750 meter signals can reach out to 200 miles or more. Communication range depends heavily on propagation conditions, the antenna system being used at both ends, and operator skill. Most operators consider the unpredictability of the band to be its biggest attraction.

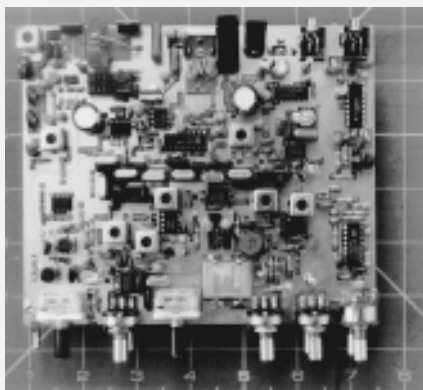


FIGURE 1. *The completed EXP-1750 Transceiver board*

■ Kit Assembly

Although most parts in the EXP-1750 kit are common through-hole components, some intermediate skill in electronic assembly and soldering is recommended. Builders who are not comfortable working with printed circuit boards and small parts should enlist the help of an experienced builder—at least for the trickier parts, such as soldering heat-sensitive IC's and other delicate components.

I was quite impressed with the clarity and completeness of the instruction manual. It begins with a brief discussion of building strategy and a list of the necessary tools for construction (all of which are commonly available).

Next, come the main assembly procedures. Construction is eased by the fact that the transceiver uses a printed circuit board. You simply insert the parts as they are called out in the instructions, and solder them in place from the underside of the board.

Rather than installing all parts on the board at once, however, the procedures are broken down into logical sections (e.g., Power Circuit, Receiver Preselector, Audio Amplifier, etc.). Each section is followed by a test/alignment procedure to verify that it is working before advancing to the next step. If each

circuit passes the test/alignment procedure, you can expect the entire transceiver to work properly when you're done. If it does not, a troubleshooting section at the back of the manual provides helpful guidance.

Besides the main assembly instructions, a section on transmitting antennas is included. It is illustrated with easy-to-understand drawings of antennas, ground radials and loading coils. The tips and ideas offered here should allow any enthusiast to construct a workable antenna for 1750 meters.

■ A Word About Power

Current U.S. and Canadian regulations allow no more than 1 watt of input power and a maximum antenna length of 15 meters (50 feet) for operation on the 160-190 kHz band. Since the EXP-1750 is capable of up to 20 watts output, users must ensure that the RF power is set within legal limits. (If an LF ham band becomes a reality in the USA, the transceiver's higher power capability could prove very useful.)



FIGURE 2. *The EXP-1750 Transceiver mounted in a prototype enclosure. This cabinet is not included with the transceiver, but is expected to be available as an option in the near future.*

■ Bottom Line

I am impressed with the features and quality of the EXP-1750 kit. It provides a no-hassle way of getting on the license-free Lower band, and doing it in high style. With a modest amount of time invested in building the kit, you'll have a versatile rig that should provide many years of service.

For additional information on the EXP-1750, visit Dave Curry's longwave web page at: www.fix.net/~jparker/currycom.htm. In the near future, the web site will also carry information for an optional enclosure for the transceiver board, which is currently being designed (see Figure 2).

Ordering Information: The EXP-1750 is priced at \$189 plus \$10 shipping & handling in the United States (\$15 elsewhere). An optional Bandpass/Notch Filter is available for \$45. The EXP-1750 may be ordered direct from Dave Curry, P.O. Box 1884 Burbank, CA 91507.

TABLE 1. SPECIFICATIONS FOR EXP-1750 METER SSB/CW TRANSCEIVER

Parameter	Specification
DC power requirement:	12-18 Vdc
Current Draw, typical:	100 mA Receive, 2.0 Amperes @ 10 watts RF output
RX Audio Output:	2.5 Watts into 8 Ohms @ 2% distortion
Operating Frequency Range:	160 to 190 kHz
Transmitter Output:	0.5 to 20 Watts (adjustable)
Operating Modes:	Single Sideband (SSB) and CW
Microphone impedance:	High or Low-Z
Metering/Indications:	Front panel illuminated "S" meter, RF Limiting LED
Front panel controls:	Power, Preselector, Tuning, Mic Gain, Volume, IF Gain, Notch, Blanking, Bandwidth
Rear Panel Connectors:	Key, Microphone, Speaker, Power, Ground, Antenna
Case Dimensions:	5.56" (14.12 cm) D x 6.56" (16.70 cm) W x 2.63" (6.70 cm) H
Weight:	1.9 Lbs. (8.6 Kg)

WHAT'S NEW?

TELL THEM YOU SAW IT IN MONITORING TIMES

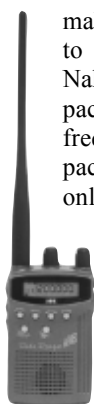
SETI package available from Grove

As radio hobbyists, *MT* readers are completely familiar with listening to signals from space (sometimes they're even intelligent signals)! Now Grove is making it easy to take your monitoring even further — into deep space in the search for extra-terrestrial intelligence (SETI).

Grove can supply your choice of receiver plus a low-noise amplifier, feedhorn, and all other necessary hardware to get you started, plus SETI League membership and technical manual. The only thing you supply is an empty TVRO dish. See Grove's ad on page 11 for details.

AOR Pocket Receiver

AOR has introduced the tiny AR16B Wide Ranger program-



mable receiver. According to Vice President "Taka" Nakayama, "In one small package the user will find frequency coverage and capacity that was unthinkable only a short time ago."

Only slightly larger than a pager, the receiver covers 500 kHz to 1.3 GHz (cellular blocked), wide and narrow FM, and AM modes, computer programming capability, S meter, rechargeable NiMH batteries (or it can operate on standard AA alkaline cells). There are 500 memory channels, 21 frequency band settings, 25 search banks, 12 selectable frequency tuning steps; scan speed is 20 max.

The AR16B is available from Grove (800-438-8155) for \$219.95. It is also available to government agencies in an un-

blocked version with voice descrambler for \$229.95.

"Pocket" protectors

To protect those new little "pocket" radios like the AR16B, the Icom R2, or a Family Radio Service two-way radio, Cutting Edge Enterprises has a stylish solution. The PowerPort PocketPRO™ is a soft glove leather pouch which fits into your pocket to safely hold your mini radio along with a spare antenna and a few pens. The fit is snug so



the radio won't slip out when you lean over. The PocketPRO is available for only \$19.95 from Cutting Edge Enterprises at 1803 Mission St., Suite 546, Santa Cruz, CA 95060, 800-206-0155 or email cee@cruzio.com

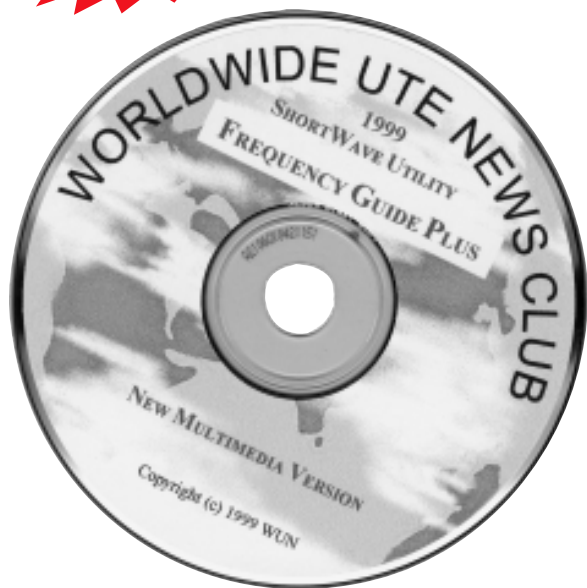
21 Band Receiver



MFJ offers a low-price 21-band radio, perfect for vacationing when you don't want to risk toting your expensive rig. The MFJ-8121 operates on FM, medium wave, long wave, and short-wave bands 1-18. It features a

NEW!

WORLD UTILITY NETWORK (WUN) FREQUENCY GUIDE ON CD-ROM!



This information-packed CD is a bonanza for the shortwave utility listener! Offering over 30,000 current (1995-1999) frequency loggings up to 30 MHz, and includes past issues of Speedx and WUN newsletters, even hundreds of WAV files, digital mode samples, text pages and graphics, and much more!

The agile frequency database allows searching by several different keys—fast! Works on Windows 95, 98, and NT, and is mirrored in html for Internet browsers without Windows.

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Call Grove Today to Order!

telescopic antenna, LED tuning indicator, world time zone and frequency charts silkscreened on the back panel, a generous 3-inch speaker, and earphone jack.

The small (4-1/2H x 7W x 1-1/2D inches) receiver requires 6 Vdc or four "AA" batteries. Call MFJ Enterprises at 601-323-5869 or www.mfjenterprises.com to order. At only \$39.95 and with MFJ's one-year warranty, there's no reason not take it along while camping, hiking, or on the beach!

Frequency Scout "Lite"

For scanner buffs who have drooled over the sophisticated Optoelectronics Frequency Scout but couldn't raise the \$344.95 purchase price,



there is now a compromise—the MiniScout. The Mini sports all the features of the Cub (filtering, frequency display, autocapture and hold, selectable gate times, etc.) but adds the ability to Reaction Tune a host scanner to the frequency being captured. Frequency coverage is 10-1400 MHz with 3 mV sensitivity. Rechargeable batteries and AC charger are included.

The Optoelectronics Mini Scout is available from Grove Enterprises for \$249.95; call 800-438-8155 or visit www.grove-ent.com for shipping and accessories.

The BeaconFinder

Many hams and shortwave listeners enjoy the tuning the spectrum below the AM broadcast band (0-530 kHz), but identifying what they hear can be a challenge, as this band is not often listed in frequency guides.



The *BeaconFinder* by MT-columnist Kevin Carey lists the frequency, ID, and location for hundreds of longwave stations that can be heard in North America, including commonly-logged foreign stations. A cross reference allows locating a station when only the ID or frequency is known. A bonus section lists utility stations operating between 1600 and 1800 kHz.

Over 60 pages of listings come ready for 3-ring binding. The booklet is available for \$11.95 postpaid (U.S. funds) from: Kevin

Carey, P.O. Box 56, West Bloomfield, NY 14585. A companion 3.5-inch diskette (RTF format) of searchable station listings is also available for \$8.95 when purchased with the *BeaconFinder*, or \$11.95 separately.

Railroad Radio Frequencies

Still going strong, Gary Sturm and Mark Landgraf have produced the 15th edition of their popular *Compendium of Railroad Radio Frequencies!* The 208-page (8-1/4" x 5-1/2") softcover



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- By Signal Strength per frequency in a "histogram".
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- By Number of hits per frequency in a "histogram".

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IF THAT ISN'T ENOUGH, try this...Multicolored, 3-D "Spectral Landscape" (Depicted at left).

SCANCAT GOLD "SE".....\$159.95 + \$ & H*

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- LINK up to 100 Disk files or ranges.

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- UNLIMITED file sizes with our exclusive SCANCAT filing method.

- Search by CTCSS & DCS tones with OS456/535 or DC440 (ICOM only).
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All the features you EXPECT from a true Windows application such as:

- UNIQUE database management system with movable columns. Even SPLIT columns into doubles or triples for easy viewing of ALL important data on one screen.
- Exclusive "SLIDE RULE" tuner. Click or "skate" your mouse over our Slide-Tuner to change frequencies effortlessly! OR use our graphical tuning knob.
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- Supports ICOM IC-R10, AR8900, YAESU and SCOUT.
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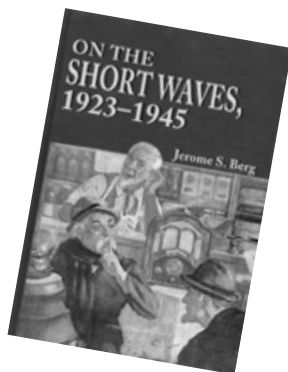
book includes 10 detailed maps, locations, frequencies and operations summaries for rail communications throughout the U.S. and in nine other countries.

The book is published by Kalmbach Publishing, publisher of *Trains Magazine*. It is available from hobby and bookstores for \$18.95, or to order direct, call (800) 533-6644.

On the Shortwaves

Nostalgia is all the rage, and the radio hobby is no exception. Millions of cassettes have been sold recreating the golden years of broadcasting from the 1920s clear up to World War II. It is appropriate that radio archivist Jerry Berg should take on the pleasant task of documenting these exciting evolutionary times in *On The Shortwaves, 1923-1945*.

Appropriately beginning with the birth of broadcasting in the



Fessenden/Marconi/DeForest days, Berg traces radio, step by step, in a most readable style. Hundreds of illustrations from historical documents and publications punctuate the book, along with great reprints of receiver ads from days gone by — Hallicrafters, Philco, Zenith, American-Bosch, and the rest. Substantive text describes these great receivers and their manufacturers.

The impact of World War II on broadcasting is heavily em-

phasized, with fond reminiscences of legendary names like Lord Hee Haw and Mr. Guess Who. This fine work is extensively footnoted and includes a comprehensive reading list and index.

Hard bound and available for \$46.50 postpaid from McFarland & Company Publishers, Box 611, Jefferson, NC 28640; order toll-free (800) 253-2187.

24 Hour clocks from MFJ

The MFJ-125 quartz wall clock shows 24 hour time, 12 hour time, day of the week, and day of the month all at a glance — It's no wonder MFJ calls this one the "DXer's Dream." Hour and minute hands are gold, while the hands on the smaller dials are black. The Dream is priced at \$29.95.

MFJ's World Map 24 hour clock shows you the time with



bright red hands against a blue and brown map background. Set this clock to GMT (UTC) and you can calculate what time it is in major cities around the world by adding or subtracting the specified number of hours as shown on the outer ring. The MFJ-115 is \$24.95.

Both clocks have 12-inch diameter faces and operate on one "AA" battery (not supplied). To order, call MFJ at (601) 323-5869 or visit them on the web at www.mfjenterprises.com

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- With the addition of AOR's SDU-5000 Spectrum Analyzer and the NEW Windows Software any radio that has a 10.7MHz IF output will give you full computer compatible spectrum analysis.
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- Just use your mouse to "arm chair" the controls. Never touch the radio once the software is running.

Supports

- AOR3000A, 5000
- R7000, R7100 ICOM
- Most ICOMs with 10.7MHz IF.

Features

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- Download our demo for test drive.

Minimum Requirements • IBM PC or 80486 or later. • Windows 3.1 or later. • 8 meg Hard Drive

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The ONLY Commercially Available Computer Control Program for the Universal M-7000 & M-8000. Also, AEA's PK-232 and the MFJ-1278

COPY-CAT PRO FEATURES

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Many radio amateurs and SWLs are puzzled! Just what are all those strange signals you can hear but not identify on the Short Wave Bands? A few of them such as CW, RTTY, Packet and Amino you'll know - but what about the many other signals?

There are some well known CW/RTTY Decoders but then there is CODE-3. It's up to you to make the choice, but it will be easy once you see CODE-3. CODE-3 has an exclusive auto-classification module that tells YOU what you're listening to AND automatically sets you up to start decoding. No other decoder can do this on ALL the modes listed below - and most more expensive decoders have no means of identifying ANY received signals! Why spend more money for other decoders with FEWER features? CODE-3 works on any IBM compatible computer with MS-DOS with at least 640Kb of RAM, and a VGA monitor. CODE-3 includes software, a complete cable to digital FSK converter with built-in 115V ac power supply, and a RS-232 cable, ready to use.

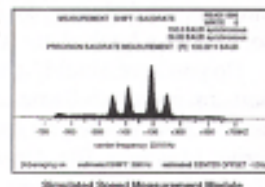
CODE-3 is the most sophisticated decoder available for ANY amount of money.

26 Modes included in PROFESSIONAL package include:

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- Tivinsplex
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- ARO-90/96
- SI-ARQ/ARQ 8
- SWED-ARQ/ARQ SWE
- ARO-EARQ2000 Duplex
- ARO-N-ARQ1000 Duplex
- Variant
- ARO-E3-CORR519 Variant
- POL-ARQ 100 Baud
- Duplex ARO
- TDM242/ARQ-M24-342
- TDM342/ARQ-M24
- FEC-A FEC188A/FEC101
- FEC-S + FEC1000 Simplex
- Sports Info 300 baud ASCII
- Heliocom-Synch/Keynet
- Solor - RAW (Normal Slot but without Synch.
- ARO-70
- Baudot F768N
- Pacdot
- WEFAK

All modes in typical baud rates with possibility of changing to any desired value of speed and shift.

User can save incoming data to disk in either ASCII or raw bit form.



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4 special ARQ 8	
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Computer on the Go

Billed as the "world's toughest laptop computer case," Pelican's new computer protector case is watertight, crushproof, airtight, and dustproof! Pelican has been building tough containers for application by military and emergency teams, and they have now extended their copolymer resin and shock absorbing experience to the protection of that valuable information locked up in your laptop computer.

Call 800-473-5422 for more information (Calif residents call 310-326-4700) or visit www.pelican.com. Not only do they have a case for your radio, too, but they have a great selection of special-application, industrial-strength rechargeable lights as well!

Weather reports over the internet

Insanely Great Software announced its much improved 32 bit WinWeather 4.0. The new version of the four year old WinWeather program has automatic gathering of the latest weather stats, satellite pictures, etc. for weather around the world.

If you are following current events closely, and have the need to know what the weather conditions are now, for almost anywhere, go to <http://www.igsnet.com/weather.html> for a FREE WinWeather v4.0 download.

City	Date	Temp	Hum	Wind	Wind Dir	Wind Spd	Wind Dir	Wind Spd
Atlanta	06/01/99	77	55	10	10	10	10	10
Chicago	06/01/99	64	46	10	10	10	10	10
Los Angeles	06/01/99	64	46	10	10	10	10	10

Reader Temp Berdan says, "The WinWeather Pro (many enhanced features) is a measly \$19.95 and includes other nifty IGS programs. Just get it and you'll see what I'm talking about."

Filters Available from Grove

Grove Enterprises carries filters for two of the most common aggravations to scanner listeners: paging signals and nearby FM broadcast transmissions. The FTR-FM filter (\$59.95), new to the Grove catalog, can reduce or eliminate intermod and image interference from those powerhouse 88-108 MHz broadcast-



To filter out the "bleep bleep" interference (sounds or swear-words, take your pick) from paging signals, identify whether the interference is from a 152, 158, or 462 MHz pager. The FTR 152, 158, or 462 filters knock down interference by 35 dB. The filters, which are \$59.95 each, can be cascaded for additional reduction. Call Grove at 800-438-8155 or visit www.grove-ent.com for details.

Local TV Solution

Thousands of viewers own a small dish for reception of Direct Broadcast Satellites, but don't have an antenna to pick up their local stations. TERK Technologies has a simple, easy, effective answer that doesn't require muscle or real estate.

TERK's TV41 and TV42 antennas clip on in minutes to any 18-inch satellite dish. The antenna contains a built-in ampli-



fier and uses only a short wire (provided) for connection, avoiding further signal loss in running additional wires to every television.

The TV42 (\$79.95 retail) is designed for dual-LNB satellite systems so you can connect directly to two TVs and watch satellite programming on one while watching local programming on the other. The TV41 (\$59.95) is designed for single-LNB dishes.

To find a dealer near you, visit the Terk dealer search engine at www.terk.com or call 800-942-8375.

Free Stuff

- *Radio Worlds* is an attractive 40-page brochure showing 75 years of radio in Germany in text and pictures. It's available on request from Deutsche Welle, English Programme, 50588 Cologne, Germany. Tell them *MT* sent you!

- If you're buying or selling new or used radio broadcast equipment, the place to do it is in the *Radio Shopper*. For a free subscription, send your name, address, title, and phone and fax numbers to: Radio Shopper, 511 18th Street SE, Rochester, MN 55904, or visit www.radioshopper.com

- Ham radio operators can post their name and call on the call wall or post their favorite ham shack photo on a new site dedicated to goods of interest to amateur radio operators. Go to <http://www.hammall.com> to check it out.

Business News

- Uniden Philippines, Inc. announced plans to close down part of its Philippines operations, which manufactured analog cellular phones as well as pagers, mobile or citizen band radios and radio scanners. An affiliate company in the Philippines will continue to manufacture cordless telephones.

The plant closure was to be effective by April 30 after 11 years due to "lower market demand for its products partly aggravated by the financial crisis," and also due to the shutdown of Uniden's research and development center in San Diego, California.

Uniden will transfer 80 percent of the equipment to its Philippine affiliate, while the rest of the equipment will be shipped to its China plant.

- David Smith <davidrs@airmail.net> announced he has pulled the popular FreeTracker program from his server, because he does not have enough time to develop and support the product. The mailing list and email support address will be removed, and no support is offered to existing users.

Books and equipment for announcement or review should be sent to "What's New?" c/o Monitoring Times, P.O. Box 98, 7540 Hwy 64 West, Brasstown, NC 28902

Press releases may be faxed to 828-837-2216 or e-mailed to mteditor@grove-ent.com.

LETTERS TO THE EDITOR

NEWS AND VIEWS FROM OUR READERS

Rachel Baughn, Editor

Legal Hairsplitting

"A couple of weeks ago, a local lady wrote a letter to *Las Vegas City Life*, upset because her association wouldn't let her put even one of the small dishes up," writes George Appleton. "I had read in *Monitoring Times* about the FCC ruling that homeowners associations could not keep people from putting up an outside antenna."

Both Appleton and another man wrote to assure the lady that, yes, she now could. But a third letter to the editor disclosed another fly in the ointment. William Carnevale wrote, "This rule does not apply to homeowners unless you own the outside of your home or condo. I own my condo and am not a renter. However, as I don't own or maintain the outside, I cannot install a DBS dish."

The FCC seems to have decided on the following rule of thumb: You may erect an antenna in any location over which you have control and which is not a common-use area, for example, a balcony or private backyard. An outside wall or the roof would be considered common-use.

Sure miss our satellite transponder guide

A number of former *Satellite Times* subscribers have written or called us regarding what they miss from that magazine. Michael Mruzek of Clinton, Michigan, says "I surely miss the 'Satellite Services Guide.' It was my armchair companion for hours and hours of satellite transponder hopping. Would you please consider continuing with its publication in *MT*?"

What we have tried to do in *MT* is to pick up those listings that are not duplicated anywhere else, in particular the SCPC and audio subcarrier transmissions. Not only are the transponder assignments already available in magazines such as *OnSat* and *Orbit*, but they change rapidly and the column was one of the most labor-intensive aspects of *ST*. Unless such an effort is underwritten by an advertiser and/or someone volunteers for the job, we see no prospect for the SSG to be included in *MT*.

Zenith vs. Bose ... and now KLH

Russ Rothbard emailed Ken Reitz regarding his March review of the Zenith Z213 AM/FM radio in which he gave the price as about \$65 from SDI Technologies.

"I called their 800 number to be told they did not sell the Z213 and referred me to



"Here's a picture of me at my monitoring post in Pittston, Maine. As you can see out the window snowy weather is a good time for my radio hobby. I have DX394 and DX390 shortwave receivers, PRO2030 and BC60XLT1 scanners, and a GE Superadio. I'm 54 years old and still in the Army Reserve. You have a great magazine covering all my radio interests."

- Jerry Bilodeau

Comtrad Industries (2820 Waterford Lake Drive, Suite 102 Midlothian, Virginia 23113, 804-744-7155). Comtrad Industries told me they sell the Zenith Z213 for \$99.95 + \$12 shipping and handling. The unit sounds great receiving AM/FM/TV/Wea. I'm afraid \$65 was too good to be true."

Now Ken Reitz has another project. He notes, "All of a sudden everybody's interested in radio. Bose set the bar as high as he could, Zenith created their own knock-off version and captured the market's low end. Now old Henry Kloss has stepped forward with a creation of his own, the Model 88. In the early 60s Kloss founded KLH, developed the original Model 8 table radio and wowed music lovers at a time when FM was just coming into its own, decades before Mr. Bose built his radio."

"Now he hopes to battle Bose for table radio supremacy. Taking a cue from Bose, he's marketing the product directly with a retail price just under \$200 — a whopping \$150 less than Bose."

Watch for Ken's review of the Model 88, coming up soon.

Lowfers

"Kevin Carey in his 'Below 500 kHz' department, reported on the ARRL's petition requesting changes in the 160 to 190 kHz Lower band. This Lower band is presently completely open to all hams that are willing to face the technical challenge of establishing communications using the present limits of one watt transmitter power and a 50 foot maximum antenna height. The changes pro-

posed by ARRL would allow 200 watts of transmitter power and an antenna height of 200 feet. These proposed changes would, no doubt, make it a lot easier to establish communications and therefore it would minimize the technical demands that now exist.

"If the ARRL proposed changes are approved, operators in this band will no longer be motivated by the challenge of technical excellence but by whomever has the most bucks to buy a 'big rig.'"

"P.S.: Hams currently have 124,770 kHz of RF spectrum for their powerful transmitters, so it seems a little greedy to go after the 30 kHz in the experimental Lower band."

— William E. Bowers, Chandler, OK

Memories of Hercules

Joseph Molon says, "A work mate and I both had experience with the Hercules and reading the January 'Computers & Radio' column brought back many memories." He pointed out that the picture identified in that article as a Nike Ajax missile was, in fact, a Nike Hercules — My fault, I'm afraid; in

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Letters, continued from page 101

searching for an elusive picture of the Ajax on the Internet, I obviously misunderstood.

Joseph goes on to say, "The Ajax was the predecessor of Hercules, was much smaller, and although the mission remained the same, Hercules can always be recognized by its four solid rocket boosters which were not present on the Ajax. Hercules could be mated with nuclear or conventional warheads and, while primarily an air defense weapon, could be outfitted for an air or ground burst depending on mission requirements.

"Actual firings of these weapons were conducted for evaluation in New Mexico, and, thankfully, we were never ordered to use them for their intended purpose. In its time, Hercules provided effective protection against a high altitude bomber attack."

Keep it Simple for the Traveler

"One of the articles in *MT* I most enjoy is 'Magne Tests.' I am always interested in reading Magne's plain language on just how good world band radios are.

"Ever since I was a little kid in the late 1930s, I have always been interested in radio. Right from the first, I would try to find how distant a station the set could pick up. So, my DX instincts arose on reading about the Grundig G4 Executive Traveller in the February *MT* and felt, how disappointing.

"Then I thought again. If I were a world traveler (which I am not), what would I want in a carrying radio? It would be small, inexpensive, not dependent on AC, and have a fairly good readout. What I would want to hear would be the up to the minute news, particularly from the VOA and BBC. Everything else would be a distant second. As these stations have many powerful relays world wide, sensitivity might not be a factor. I feel that this is what Grundig has in mind, and more power to them.

"All world travelers should carry a small world band radio; it could be a lifesaver. I remember reading an article in the *PWBR* a few years ago. It was by a man who was trapped in Teheran when the Khomeini took over Iran. He could see out his hotel window the Shah's and the Khomeini's forces battling each other. But the city's radio broadcast only music and the TV had a Don Knotts movie — nothing about the fighting. Because he had a small world band radio, he learned the true facts via the VOA, BBC, and DW and escaped becoming a hostage."

— Bob Fraser, Cohasset, MA

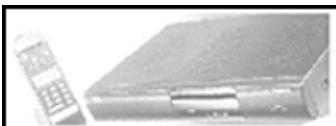
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INDEX OF ADVERTISERS

Alinco	75
Antique Radio Classified	69
Boger Electronics	81
C. Crane	Cover III
Communications Electronics	25
Computer Aided Technologies	98, 99
CRB Research	93
DX Computing	47
Fineware	89
Glenn Hauser	35
Grove Enterprises	11, 19, 39, 65, 79, 91, 97
Grundig	Center Section
ICOM	1
Jacques d'Avignon	55
John Figliozzi	53
Kevin Carey	81
KIWA Electronics	23
Klingenfuss	31
Luke DP-976	21
Monitoring Times	63
Motron	67
Nil-Jon Antennas	5
OptoElectronics	Cover II, IV
Popular Communications	21
Racing Electronics	21
Radiomap	93
Radioworld Inc.	95
R.C. Distributing	15
RDI White Papers	91
Sangean	Cover III
Scanner Master	85
Skyvision	71
Stridsberg Engineering	27
Swagur Enterprises	103
Universal Electronics	13
Universal Radio	89
Viking International	7
W5YI	101
WiNRADiO	9

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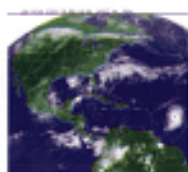
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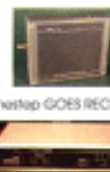
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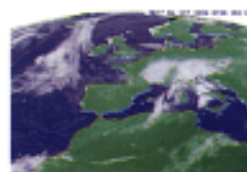
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By Bob Grove,
Publisher

Scanner Listeners and the Law

Two topics dominate the hobby radio scene this month, the anti-cellular-scanner ruling from the Federal Communications Commission, and the controversial, strong-arm arrest of noted scanner aficionado Bill Cheek and his wife. We'll take a look at both, along with their implications.

The FCC Tweaks its Scanner Regulations

The FCC has finally handed down its long-awaited Report and Order redefining scanners and their limitations with regard to cellular coverage. In a thumbnail sketch, here are their rulings:

1. A scanning receiver is any 30-960 MHz receiver which automatically switches between two or more channels, stopping on an active signal. Exempted from this definition are system-licensed radios like cellular telephones and amateur radios with ham-band-only coverage.
2. Test equipment is exempted from the ruling and may be purchased by the public.
3. New scanners must have cellular-image-frequency response attenuated by at least 38 dB.
4. Frequency determination circuits must be inaccessible so that tampering would likely render the scanner inoperable.
5. Kits for scanners and frequency converters must conform the same as manufactured products.
6. Any business which modifies scanners on an ongoing basis, regardless of the dates of the scanners' manufacture, is in violation.
7. Manually-tuned (non-scannable) receivers may include cellular frequencies.
8. Permanent labels will be required on all new scanners warning of possible violation.

So what does all this mean to the scanning enthusiast? Nothing new that hasn't been in place for several years now: Any scanner you buy that is FCC type-accepted and unmodified is lawful for you to own, even if it is an older model with cellular coverage off the shelf; no one can engage in the business of modifying scanners in such a way as to alter its original certification, such as frequency coverage; anyone can purchase a piece of laboratory test equipment even if it is capable of intercepting cellular telephone calls; you may not listen to cellular telephone calls.

We are relieved to see this enlightened rulemaking by the Commission. In spite of demands from the cellular industry to penalize scanner hobbyists even more, the FCC has displayed wisdom in its Report and Order. With millions of scanners in active use around the country, harmful eavesdropping violations are vanishingly small. The fact that the radiotelephone industry has abdicated its responsibility to provide real privacy for its paying customers has not gone unnoticed.

The Feds Tweak Bill Cheek

On yet another front of zealous persecution, well-known scanner technician/hobbyist Bill Cheek, *MT's Experimenter's Workshop* columnist, and his wife, Cindy, were jarred by a banging on their door at 7 a.m., Wednesday, March 31. Opening the door, the couple was strong-armed into custody and handcuffed by agents of the FBI, Secret Service, U.S. Customs, Postal Inspectors, and local police, then removed to jail for fingerprinting and confinement, according to Bill.

This experience was, of course, extremely frightening and disillusioning to a decent man and his wife who have been taught to respect law enforcement authorities, never expecting to be subdued by mass force in the security of their own home, then forced to jail in handcuffs.

Now released (along with Cindy) on his own recognizance, Bill reports that the agents confiscated computers, software, business files, and products he retails (most of which were returned within a few days). Apparently the agents targeted Bill's "data slicer" or data decoder, a device which enables any radio listener to tune in the unintelligible buzz of digital noise and convert it to data pulses which, in turn, can be manipulated by a computer program to restore the original message or image.

Hobbyists feel that the arrest was a distinct trampling of civil rights since data decoders have been used for years by hams, experimenters, computerists, and anyone else involved in digital communications. They are, in themselves, completely innocuous. It is only when they are used with software to decipher communications that are specifically protected that they become a threat.

Earlier that month, New York radio/computer enthusiast Keith Knipschild posted on his Web site 93 pages of messages sent by the police

on their mobile data terminals (MDTs), as intercepted by his data slicer/decoder program, apparently in direct violation of the 1934 Communications Act. After charging Knipschild, law enforcement officials appear to have gone after the source of the hardware and software.

Giving the Crystal Ball a Tweak

Are these two actions foreboding to scanner hobbyists? Not if they confine their listening habits to what has been considered fair game for several years. Trouble is, most hobbyists have considered MDTs to be fair game, except in cases where state law prohibits interception (Texas, for example). Until more specifics are known about what was targeted in Bill Cheek's case, however, some questions will remain unanswered.

With a few exceptions, a listener may monitor any broadcast and any communication *not* digitized for privacy, nor sent by pager, nor conducted by cordless or common carrier telephone. As long as he doesn't publicize or profit from such communications, a listener won't get into trouble.

Still unanswered is the question: Does digitization of a message automatically imply privacy? It is permitted to intercept a communication made through a system that is "readily accessible to the general public." The law defines that phrase to mean it is not scrambled or encrypted and is sent in a public or known code.

Most MDTs utilize simple ASCII code — known and used worldwide. They are a communication made by a public service agency, which the public is allowed to monitor (though divulgence of the contents is probably not allowed without permission). However, some MDT systems use a 4-level frequency shift keying (FSK) mode. Although FSK is included in the APCO-25 public safety digital standard (which will hopefully be opened to the public), it is also a mode used by some paging systems, which are off bounds to monitors.

Digitization is primarily desired for spectrum efficiency and message accuracy, but the more complicated technology becomes, the more complex are the issues. The future is increasingly digital, and, until a meaningful standard is set differentiating between simple digitization for efficiency and encryption for privacy, scanner listeners will keep wondering what kind of a future it will be for them.

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